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Draft Site Treatment Plan

by

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Savannah River Site
Aiken, South Carolina 29808

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SAVANNAH RIVER SITE

MIXED WASTE

**DRAFT SITE
TREATMENT PLAN
(DSTP)**

Volumes I and II

AUGUST 30, 1994

MASTER

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CHAPTER 1.0 PURPOSE AND SCOPE OF THE COMPLIANCE PLAN VOLUME

For each facility at which the Department of Energy (DOE) generates or stores mixed waste, Section 3021(b) of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6721, as amended by Section 105(a) of the Federal Facility Compliance Act [(P.L. 102-386) (the FFCAct)], requires DOE to prepare a plan for developing treatment capacities and technologies to treat the mixed waste to the standards promulgated by the U.S. Environmental Protection Agency (EPA) pursuant to Section 3004(m) of RCRA. Upon submission of a plan to the appropriate regulatory agency, the FFCAct requires the recipient agency to solicit and consider public comments, and approve, approve with modification, or disapprove the plan within six months. The agency is to consult with EPA and any state in which a facility affected by the plan is located. Upon approval of a plan, the agency shall issue a Compliance Order requiring compliance with the approved plan.

Site Treatment Plans (STP) are required for facilities at which the Department generates or stores mixed waste, defined by the FFCAct as waste containing both a hazardous waste subject to RCRA, and a source, special nuclear or by-product material subject to the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.). On April 6, 1993, DOE published a Federal Register Notice (58 Fed. Reg. 17875) describing its proposed process for developing the STPs in three phases, including a Conceptual Site Treatment Plan (CSTP), a Draft Site Treatment Plan (DSTP), and a Final Site Treatment Plan (FSTP). On October 27, 1993, SRS submitted the CSTP to the State of South Carolina. The purpose of this DSTP is to identify the currently preferred options for treating mixed wastes at SRS or for developing treatment technologies where technologies do not exist or need modification. The DSTP reflects the site-specific preferred options, developed with the state's input and based on existing available information. The options reflect the "bottom-up" approach used to prepare the DSTP and have not been completely evaluated for impacts on other DOE sites or impacts to the overall DOE program. Therefore, changes in the preferred options and associated schedules are possible between the DSTP, the FSTP, and final approval and issuance of the order as evaluation of the DOE-wide impacts State-to-State discussions progress.

To the extent possible, the DSTP identifies specific treatment facilities for treating the mixed waste and proposes schedules as set forth in the FFCAct. Where the selection of specific treatment facilities is not possible, schedules for alternative activities such as waste characterization and technology assessment are provided in the DSTP, if available. All schedule and cost information presented is preliminary and is subject to change. For new facilities, the schedule is heavily dependent upon decisions made during the design phase and contingent on funding availability. Assumptions and professional judgments related to the type of treatment technology, location of the treatment facility, contracting mechanism, project approval process, cost, etc. were used to develop the estimated schedules. Any variation in the assumptions often will impact the estimated schedule. In addition, cost data used in developing options and schedules and provided in the DSTP are planning estimates only and do not reflect a commitment of budgetary resources.

Emerging or new technologies not yet considered may be identified in the future that provide opportunities to manage waste more safely, effectively and at lower cost than the current technologies identified in the DSTP. Working closely with regulators and other interested parties during the implementation of the FSTP, DOE will continue to evaluate and develop technologies that offer potential advantages in the areas of public acceptance, risk abatement, performance and life cycle cost. Should more promising technologies be identified, DOE may request a modification of its treatment plan in accordance with provisions of the FSTP and/or the Compliance Order.

The Draft Site Treatment Plan is comprised of two volumes: this Compliance Plan Volume and the Background Volume. The Compliance Plan Volume proposes overall schedules with target dates for achieving compliance with the land disposal restrictions (LDR) of RCRA and procedures for converting the target dates into milestones to be enforced under the Order.

The more detailed discussion of the options contained in the Background Volume is provided for informational purposes only.

When finalized, the FSTP will satisfy DOE's obligation under the FFCAct to develop and submit a treatment plan for SRS. In addition, inasmuch as the FSTP is intended to provide DOE's plans for achieving compliance with the LDR requirements of Section 3004(j) of RCRA at SRS, it is understood that no further civil enforcement action, administrative or judicial, will be initiated for violations of RCRA Section 3004(j) arising from storage of mixed waste covered by the approved FSTP for so long as DOE is in compliance with the requirements of the approved FSTP and its Order. This will include all mixed waste in storage at SRS and identified in the approved FSTP, as well as future mixed waste generated and incorporated into the FSTP in accordance with the provisions of the FSTP, and any mixed waste received from offsite which is being accumulated to facilitate the treatment of such waste at SRS and which is covered in another site's treatment plan approved by the appropriate regulatory agency after consultation with the State of South Carolina.

CHAPTER 2.0 IMPLEMENTATION OF THE PLAN

Chapter 2.0 describes certain provisions DOE proposes to include in the Final Site Treatment Plan for SRS to facilitate implementation of the FSTP. This DSTP provides a general description of what these provisions would be intended to achieve and the approach DOE proposes; it is expected that the specific language to be used in the FSTP and Order, as well as specific milestones, will be developed in conjunction with the State of South Carolina and the South Carolina Department of Health and Environmental Control (SCDHEC). As discussions on the FSTPs and Orders progress, the FSTPs for some sites may eventually be expanded to address other administrative provisions or, alternatively, some or all of these provisions may be incorporated into the Order.

Section 2.1 Approach to Setting Milestones

This Section of the FSTP would establish a process for committing to milestones for specific activities based on the target dates in the activity schedules provided in Section 3.0 through 5.0 of the Compliance Plan Volume. In the proposed approach outlined below, milestones would be defined as fixed, enforceable near-term dates on which a specified activity must be completed. Target dates would mark the anticipated completion of longer-term tasks and would not be enforceable until converted to milestones.

Activities to be proposed as milestones and target dates would generally be the activities identified in the FFCAct for wastes with existing technology, for waste for which technology does not exist or needs adaptation, or for providing information when radionuclide separation is involved. However, other closely related activities, such as completion of design or characterization activities, may be proposed as milestones and target dates as well.

Activity schedules for certain treatment options provided in this DSTP Compliance Plan Volume are considered "best estimate" target dates which will be finalized prior to the FSTP and Order being implemented. In general, the DSTP Compliance Plan Volume contains estimated target dates for completion of those activities specified by the FFCAct for the preferred mixed waste treatment options that are ongoing or that are currently funded and either under construction or procurement. However, for treatment options for which there are significant uncertainties which may involve the technical approach, characterization data, or funding availability, activity schedules are being developed for inclusion in the FSTP.

Target dates provided in the activity schedules would be converted into milestones as the FSTP is implemented according to procedures established in Chapter 2.0. DOE-SR proposes establishing milestones for long-term projects such as those that will be covered by the FSTP on a gradual basis because such projects are subject to significant uncertainties including those outlined in the above paragraph. In this manner, knowledge of project design, construction and operation can be factored into establishing milestones. This is necessary to allow for the special considerations that may be required for many of the treatment technologies proposed in the STP, since adaptation in the design and application of the technology may be necessary to address the radionuclide component of the mixed waste in order to meet LDR treatment standards.

The SRS proposed approach involves establishing milestones on an annual basis for near-term activities. Milestones would be proposed for approval for activities that will take place in the current federal fiscal year, with target dates covering longer-term activities. Each fiscal year during the Annual Update, described below in Section 2.2, target dates for that fiscal year period would be converted to milestones. Under this approach the timing of the annual update would occur after the DOE-SR receipt of current fiscal year funding, allowing DOE and SCDHEC to establish commitments as funding information becomes known. In addition, this proposed approach allows for milestones to be established in the near term when there is a good technical understanding of the work involved in carrying out the next phase and will allow for long term planning through the use of target dates. In addition, it is anticipated

that this approach will allow SCDHEC, with input from the public as appropriate, to play a more significant role in establishing work priorities at the site each year. Other DOE sites may propose different approaches.

For mixed waste to be shipped offsite, the final milestone and target date associated with the wastes would be the date of shipment. Other milestones and target dates for offsite activities related to preparing wastes for shipment could be proposed. When the intended treatment site is a DOE site, the Section would recognize that the development and availability of such offsite capacity is pursuant to the FSTP and Order or other enforceable agreement of that site.

The Section would reference procedures for setting new milestones and for modifying milestones and target dates when necessary. Generally, where practical, new milestones and changes to target dates would be achieved through Section 2.2, "Annual Site Treatment Plan Update." Modifications to current milestones would be governed by procedures in Section 2.5 "Modifications/Extensions or Revisions to the Plan."

Section 2.2 Annual Site Treatment Plan Update

This Section of the FSTP would provide for submission of an Annual Site Treatment Plan Update intended to communicate information on progress in implementing the FSTP and to provide a mechanism for establishing new milestones, amending wastes covered by the FSTP, and updating the FSTP, as well as proposing revisions to the FSTP when necessary. These latter actions may be accomplished through other mechanisms as described in other Sections of this Plan, but the Annual Update provides a coordinated mechanism to effect such changes on a routine basis. DOE proposes that all sites with a Site Treatment Plan provide Annual Updates in the same timeframe to facilitate necessary site and State interactions and to facilitate tracking progress across the DOE complex in developing treatment capacity and treating mixed waste.

The Annual Update would amend the Background Volume as necessary, identifying changes to mixed wastes covered by the FSTP, including volumes; new waste streams and waste streams no longer covered by the FSTP; and progress on activities undertaken to carry out the FSTP.

The Annual Update would also update the Compliance Plan Volume. It would contain proposals for new milestones, identify any changes to target dates, and propose revisions to the FSTP in accordance with Section 2.5, "Modifications/Extensions or Revisions to the Plan."

The Annual Update would be submitted to SCDHEC for review and comment or approval, as appropriate, and made publicly available as defined in this Section and in accordance with the procedures in Section 2.8, "Submittal, Review and Approval of Deliverables." After the appropriate procedures are followed, the Compliance Plan Volume would be considered amended.

It is intended that the Annual Update be prepared in a way that minimizes unnecessary paperwork to the extent practical through page changes, etc. If there are no changes that require updates to the Compliance Plan and Background Volumes in a given year, a letter notifying SCDHEC to that effect could be provided as an Annual Update.

Section 2.3 Inclusion of New Waste Streams

This Section of the FSTP would establish procedures for incorporating newly identified and newly generated or stored waste streams into the FSTP and for developing a plan and schedules for providing treatment capacity.

It would establish procedures for notifying SCDHEC of a new waste stream as soon as possible. The notification would describe the waste code, volume, current and expected

generation rate, and technology needs to the extent possible and would include the waste as a covered waste, as appropriate.

The next Annual Update would incorporate the new waste streams and propose a plan for treatment and associated schedules where possible, or schedules for developing a treatment plan as required by the FFCAct if necessary.

Section 2.4 Duration of the Plan and Deletion of Wastes

This Section of the FSTP would establish that the approved FSTP will terminate when the site's mixed wastes, regardless of the time they were generated, are in compliance with LDR requirements, including the storage prohibition in RCRA 3004(j). This will occur: 1) when there is no longer any mixed waste stored or generated at the site that does not meet land disposal restriction requirements, or 2) when the mixed waste currently being stored or generated at the site, or that will be stored or generated, is stored solely for the purpose of accumulating such quantities as are necessary to facilitate proper treatment, recovery, or disposal.

Similarly, it would establish that a specific waste would be deleted from the FSTP when the waste is no longer being stored or generated at the site, or when the waste meets LDR standards or is being accumulated solely for the purpose of accumulating such quantities as are necessary to facilitate proper treatment, recovery, or disposal. This could occur, for example, when the last scheduled milestone under the FSTP for treating the waste is completed; when the waste is shipped offsite, or when the characterization of the waste demonstrates it meets RCRA LDR standards.

The Section would allow DOE and SCDHEC to agree to terminate the FSTP or to keep the FSTP in effect, e.g., in anticipation of waste to be generated in the future, for reasons other than those provided above.

The Section would provide for notification of SCDHEC and other procedures as appropriate for terminating the FSTP and for deleting waste streams.

Section 2.5 Modifications/Extensions or Revisions to the Plan

Section(s) of the FSTP would establish procedures to enable DOE to seek adjustments to milestones when events cause or may cause the need for a modification or extension, and would define the circumstances which justify a modification or extension. It would require DOE to notify SCDHEC, provide an explanation for the modification/extension, and set procedures for reviewing and approving/disapproving alternative milestones.

It would define and establish procedures for those revisions to the FSTP that would require SCDHEC to follow procedures in Section 3021(b)(2) and (3) of RCRA, as amended by the FFCAct, including providing the proposed revision to the public and consulting with other affected states and EPA. The Annual Update described in Section 2.2 generally would be used to propose and approve a revision, unless the revision would become effective before it could be addressed in the regularly scheduled Annual Update.

DOE proposes that all FSTPs consistently define what constitutes a "revision" to the plan that is subject to Sections 3021(b)(2) and (3) of the FFCAct, since such a revision often may require the involvement of other affected States. Revisions would include addition of treatment capacity, technology development or use of radionuclide separation not previously included in the Compliance Plan Volume of the FSTP or extensions to milestones for a period greater than one year. Inclusion of new waste streams would not constitute a revision but may result in a revision if inclusion of the new waste results in a change to the FSTP that meets one of the above criteria. Other types of modifications to the FSTP such as milestone

changes of less than one year although not a "revision" would require approval as described in Section 2.8.

Section 2.6 Funding Considerations

This Section would describe DOE's obligations to seek funding necessary to accomplish the activities proposed by DOE in the FSTP. DOE's obligations would be described consistent with the Federal appropriations process and would reflect the roles of all parties involved including DOE, Office of Management and Budget (OMB) and Congress. It would confirm DOE's authority over its budget and funding level submissions and its responsibilities under the Anti-Deficiency Act, 31 U.S.C. Section 1341, as amended.

Section 2.7 Disputes

This Section would provide procedures to address disputes concerning scheduling under Section 2.1, "Modifications/Extensions or Revisions to the Plan" under Section 2.5, "Submittal, Review and Approval of Deliverables" in Section 2.8, and other circumstances agreed to by DOE, SCDHEC and the State of South Carolina. The Section would establish timeframes to resolve a dispute and a process that would elevate the dispute when agreement cannot be reached.

Section 2.8 Submittal, Review and Approval of Deliverables

This Section would establish a process and timeframes for review, comment, response to comments, and approval as appropriate by the DOE and SCDHEC of such deliverables as the Annual Update, notices signifying completion of milestones and identification of new wastes, and other deliverables.

**User's Guide to Chapters 3.0, 4.0, & 5.0
Plan and Schedules**

The following sections contain target dates that would be converted into milestones as the FSTP is implemented according to procedures established in Chapter 2.0 of this volume. Chapter 3.0 identifies low-level mixed waste streams, Chapter 4.0 identifies TRU mixed waste streams, and Chapter 5.0 identifies high level mixed waste.

The table below identifies each mixed waste stream and the section where the waste stream is described. Waste streams that have been eliminated, combined, are in compliance, or will be in compliance by 10/95 do not appear in Volume I.

Waste Stream No.	Waste Stream Name	PO	Volume I	Volume II
SR-W001	Rad-Contaminated Solvents	CIF – Incineration	3.1.1	3.1I.1
SR-W002	Rad-Contaminated Chlorofluorocarbons	CIF – Incineration	3.1.1	3.1I.2
SR-W003	Solvent Contaminated Debris (LLW)	CIF – Incineration	3.1.1	3.1H.1
SR-W004	M-Area Plating Line Sludge from Supernate Treatment	M-Area Vendor Treatment Process	3.1.2	3.1F.1
SR-W005	Mark 15 Filter Cake	M-Area Vendor Treatment Process	3.1.2	3.1F.2
SR-W006	Mixed TTA/Xylene	TRU Waste Management Plan	4.1	4.1B.1
SR-W007	SRL (SRTC) Low Activity Waste	SRTC Ion Exchange	N/A	3.1A.1
SR-W008	SRL (SRTC) High Activity Waste	SRTC Ion Exchange	N/A	3.1A.2
SR-W009	Silver Coated Packing Material	Containment Bldg. – Macroencapsulation in S. S. Container	3.1.3	3.2B.1
SR-W010	Scintillation Solution	CIF – Incineration	3.1.1	3.1I.3
SR-W011	Cadmium Coated HEPA Filter	M-Area Vendor Treatment Process	3.1.3	3.1E.5
SR-W012	Toxic Cleanup Material	CIF – Incineration	3.1.1	3.1H.2
SR-W013A	Low Level Waste Lead (Uncombined Elemental Lead)	Offsite Vendor	3.1.3	3.1C.1
SR-W013B	Low Level Waste Lead (Combined Lead)	Macroencapsulation – Location TBD	3.1.3	3.1C.2
SR-W014	Tritiated Mercury	Offsite DOE-INEL-WEDF Amalgamation	3.1.3	3.1G.2
SR-W015	Mercury Contaminated Equipment	Macroencapsulation in S. S. Container as a 90-day Generator	N/A	3.1E.3
SR-W016	221-F Canyon High Level Liquid Waste (HLW)	DWPF	5.1.1	5.1A.1
SR-W017	221-H Canyon High Level Liquid Waste (HLW)	DWPF	5.1.1	5.1A.2
SR-W018	Filter Paper Take Up Rolls	CIF – Incineration	3.1.3	3.1H.3
SR-W019	244-H RBOF High Activity Liquid Waste	Consolidated with SR-W017	N/A	2.2.2
SR-W020	In-Tank Precipitation (ITP) Filters	Meets Treatment Standard	N/A	3.1E.1
SR-W021	Poisoned Catalyst Material	Waste stream eliminated	N/A	2.2.2

Waste Stream No.	Waste Stream Name	PO	Volume I	Volume II
SR-W022	Defense Waste Processing Facility (DWPF) Benzene	CIF – Incineration	3.1.1	3.1I.4
SR-W023	Safety/Control Rods	Macroencapsulation in a cask, as a 90-day generator	N/A	3.1E.2
SR-W024	Gold Traps	Meets Treatment Standard	N/A	3.1G.1
SR-W025	Solvent Waste <100 nCi/g TRU	TRU Waste Management Plan	3.1.3	3.3A.1
SR-W026	Thirids TRU Waste	TRU Waste Management Plan	4.1	4.1A.1
SR-W027	Solvent TRU Waste	TRU Waste Management Plan	4.1	4.1A.2
SR-W028	Mark 15 Filter Paper – F006	CIF – Incineration	3.1.3	3.1H.4
SR-W029	M-Area Sludge Treatability Samples	M-Area Vendor Treatment Process	3.1.2	3.1B.1
SR-W030	Spent Methanol Solution	CIF – Incineration	3.1.1	3.1I.5
SR-W031	Uranium/Chromium Solution	M-Area Vendor Treatment Process	3.1.3	3.1A.6
SR-W032	Mercury Contaminated Heavy Water	D-Area Facility	N/A	3.1A.3
SR-W033	Thirids Waste <100 nCi/g TRU Rad	TRU Waste Management Plan	3.1.3	3.3A.2
SR-W034	Calcium Metal	Containment Bldg. – Wet Oxidation	3.1.3	3.1K.1
SR-W035	Freon 11/Oil Mixture	CIF – Incineration	3.1.1	3.1I.6
SR-W036	Radioactive Oil	Not determined	3.1.3	3.2A.1
SR-W037	M-Area High Nickel Plating Line Sludge	M-Area Vendor Treatment Process	3.1.2	3.1F.3
SR-W038	Plating Line Sump Material	M-Area Vendor Treatment Process	3.1.2	3.1F.4
SR-W039	Nickel Plating Line Solution	M-Area Vendor Treatment Process	3.1.2	3.1A.4
SR-W040	M-Area Stabilized Sludge	Waste stream eliminated	N/A	2.2.2
SR-W041A	Aqueous Mercury and Lead	Effluent Treatment Facility	3.1.3	3.1A.7
SR-W041B	Aqueous Mercury and Lead (Elemental Mercury)	Offsite DOE-INEL WEDF Stabilization	3.1.3	3.1G.3
SR-W041C	Aqueous Mercury and Lead (Mercury Contaminated Recorder)	Macroencapsulation in S. S. Container with SR-W015	3.1.3	3.1E.4
SR-W042	Paints and Thinners	CIF – Incineration	3.1.3	3.1J.1
SR-W043	Lab Waste w/Tetraphenyl Borate	CIF – Incineration	3.1.3	3.1H.5
SR-W044	Tributyl Phosphate & n-Paraffin – TRU	Consolidated with SR-W045	N/A	2.2.2
SR-W045	Tributyl Phosphate & n-Paraffin	CIF – Incineration	3.1.3	3.1I.7
SR-W046	Consolidated Incinerator (CIF) Ash	CIF – Ashcrete	N/A	3.1F.5
SR-W047	Consolidated Incinerator (CIF) Blowdown	CIF – Ashcrete	N/A	3.1A.5
SR-W048	Waste Sites/Spill Site Soil	M-Area Vendor Treatment Process	3.1.3	3.1L.1

Waste Stream No.	Waste Stream Name	PO	Volume I	Volume II
SR-W049	Tank E-3-1 Clean Out Material	Offsite DOE-INEL-WEDF Stabilization	3.1.3	3.1F.6
SR-W050	Mixed Waste to Support HL Waste Processing Demonstrations	Treatment by SRTC 90-day generator followed by vitrification	N/A	5.1C.1
SR-W051	Spent Filter Cartridges	CIF – Incineration	3.1.3	3.1D.1
SR-W052	Cadmium Contaminated Glovebox Section	Waste stream eliminated	N/A	2.2.2
SR-W053	Rocky Flats Incinerator Ash	Return to Rocky Flats	4.2	4.2A.1
SR-W054	Enriched Uranium Contaminated with Lead	Consolidated with SR-W037	N/A	2.2.2
SR-W055	Job Waste Containing Solvent Contaminated Wipes	CIF – Incineration	3.1.3	3.1H.6
SR-W056	Job Waste with Enriched Uranium and Solvent Applicators	CIF – Incineration	3.1.3	3.1H.7
SR-W057	D-Tested Neutron Generators	Waste stream eliminated	N/A	2.2.2
SR-W058	Mixed Sludge Waste with Mercury-DWPF Treatability Studies	SRTC 90-day generator followed by vitrification	N/A	5.1B.1
SR-W059	Tetrabutyl Titanate (TBT)	CIF – Incineration	3.1.3	3.1I.8
SR-W060	Tritiated Water with Mercury	TBD	3.1.3	6.3

CHAPTER 3.0 LOW-LEVEL MIXED WASTE TREATMENT

Days are defined as calendar days; Activities defined as occurring within a given quarter shall be completed by the last day of the quarter.

Section 3.1 Mixed Waste Streams for Which Technology Plans & Schedules Exist

3.1.1 Consolidated Incineration Facility (CIF)

CIF is the preferred option for the following waste streams:

SR-W001, Rad-Contaminated Solvents
SR-W002, Rad-Contaminated Chlorofluorocarbons
SR-W003, Solvent Contaminated Debris (LLW)
SR-W010, Scintillation Solution
SR-W012, Toxic Cleanup Material
SR-W022, Defense Waste Processing Facility Benzene
SR-W030, Spent Methanol Solution
SR-W035, Freon 11/Oil Mixture

Estimated Schedule for this onsite facility (target dates – not yet finalized)

Submittal of all applicable permit applications:
Completed

Initiating Construction:
Completed

Conducting Systems Testing:
Initiated testing 4th quarter FY95.

Testing period shall mean the period following completion of the CIF construction when the facility performs integrated testing, such as test burns using simulated or actual waste, to determine readiness to conduct a trial burn, before the receipt of waste for incineration.

Commencing Operations:
commence facility operations 2nd quarter FY96.

Commence operations shall mean the introduction of waste into the rotary kiln or secondary combustion chamber for treatment after completion of the operational readiness reviews, testing period, and trial burn.

Processing Backlogged and Currently Generated Mixed Waste:
Submit an annual LDR waste processing rate at the CIF within 90 days after commencing operations.

Schedule Assumptions

The ability to perform in accordance with the estimated schedule for the CIF is contingent upon the following:

- Receipt of adequate funding to support the rate of progress
- Completion of appropriate NEPA documentation Waste Management EIS and issuance of a Record of Decision (ROD) on CIF. Decisions reached following additional NEPA review are expected to be consistent with the alternatives specified in the estimated schedule for CIF. Selection of an alternative may require submittal of a revised proposal.

- No significant technical deficiencies are identified during the trial burn or from an Operational Readiness Review that would impact the schedule.
- SCDHEC approval of RCRA permit revisions by April 1, 1995 for waste management processes, (e.g., blowdown stabilization and update of the trial burn plan to revise feed rate) necessary to support CIF operation and startup.
- Implementation of the EPA Combustion Strategy does not necessitate changes to the trial burn plan or the facility which causes schedule extensions.

3.1.2 M-Area Vendor Treatment Process

M-Area Vendor Treatment Process is the preferred option for the following mixed waste streams:

SR-W004, M-Area Plating Line Sludge from Supernate Treatment
SR-W005, Mark 15 Filter Cake
SR-W029, M-Area Sludge Treatability Samples
SR-W037, M-Area High Nickel Plating Line Sludge
SR-W038, Plating Line Sump Material
SR-W039, Nickel Plating Line Solution

Estimated Schedule for this onsite facility (target dates – not yet finalized)

Submittal of all applicable permit applications:
Completed

Entering into Contracts:
Completed

Initiating construction:
Within 30* days of the effective date of the Industrial Wastewater or Air Quality Control Permit, whichever is later.
Initiating construction shall mean beginning of work necessary to pour concrete foundations.

Conducting Systems Testing:
Within 180* days of the effective date of the Industrial Wastewater or Air Quality Control Permit, whichever is later.
Conducting systems testing shall mean initiating of equipment testing to ensure that operating specifications are met.

Commencing Operations:
Initiate M-Area Vendor Treatment of the LDR waste on or before 225* days after the effective date of the Industrial Wastewater or Air Quality Control Permit, whichever is later. This includes 180 days for mobilization of the vendor's equipment, plus 45 days to conduct a formal operational readiness self-assessment, if determined to be required by DOE-SR, on the vendor's process and equipment.

Commence operations is the start of preparation by the vendor of the initial homogeneous feed batch for the vitrification unit.

Processing Backlogged and Currently Generated Mixed Waste:
Initiate waste processing of the M-Area waste within 60* days of the Commence Operations phase.

Complete processing of all waste and treatment of all residues resulting from the closure activities within 24* months of the start of waste processing.

*Vitrification technology has been selected for the M-Area Vendor Treatment Process. The project schedule is currently being evaluated and reviewed.

Schedule Assumptions

The ability to perform in accordance with the estimated schedule for M-Area Vendor Treatment Process is contingent upon the following:

- Receipt of adequate funding to support the rate of progress for this project
- Compliance by the subcontractor with the terms of the contract
- Approval by SCDHEC of the proposed closure plan for the tank system. Closure will, by necessity, exceed the normal 180 days allowed for closure after receipt of the final volume of hazardous waste per SCHWMR R.61-79.265.113(b).
- Approval by SCDHEC of a wastewater construction permit no earlier than December 31, 1994.

3.1.3 Undetermined Facility Schedules

The following mixed waste streams will have schedules submitted at a later date:

SR-W009, Silver Coated Packing Material
SR-W011, Cadmium Coated HEPA Filters
SR-W013A, Low-Level Waste Lead (Uncombined Elemental Lead)
SR-W013B, Low-Level Waste Lead (Combined Lead)
SR-W014, Tritiated Mercury
SR-W018, Filter Paper Take Up Rolls
SR-W025, Solvent Waste <100 nCi/g TRU
SR-W028, Mark 15 Filter Paper – F006
SR-W031, Uranium/Chromium Solution
SR-W033, Thirds Waste <100 nCi/g TRU Rad
SR-W034, Calcium Metal
SR-W036, Radioactive Oil
SR-W041A, Aqueous Mercury and Lead
SR-W041B, Aqueous Mercury and Lead (Elemental Liquid Mercury)
SR-W041C, Aqueous Mercury and Lead (Mercury Contaminated Recorder)
SR-W042, Paints and Thinners
SR-W043, Lab Waste w/Tetraphenyl Borate
SR-W045, Tributyl Phosphate & n-Paraffin
SR-W048, Waste Sites/Spill Site Soil
SR-W049, Tank E-3-1 Clean Out Material
SR-W051, Spent Filter Cartridges
SR-W055, Job Waste Containing Solvent Contaminated Wipes
SR-W056, Job Waste with Enriched Uranium and Solvent Applicators
SR-W059, Tetrabutyl Titanate (TBT)
SR-W060, Tritiated Water with Mercury

CHAPTER 4.0 TRU MIXED WASTE STREAMS

Section 4.1 TRU Wastes Expected to Go to WIPP

SR-W006, Mixed TTA/Xylene
SR-W026, Thirds TRU Waste
SR-W027, Solvent TRU Waste

Section 4.2 Other TRU Wastes

SR-W053, Rocky Flats Incinerator Ash

The preferred treatment for this waste stream is shipment to Rocky Flats for treatment.

Estimated Schedule

Scheduled to be shipped to Rocky Flats for treatment to be determined, but expected to be no sooner than 2006.

Schedule Assumptions

Treatment in accordance with the estimated schedule is contingent upon the following:

- Receipt by Rocky Flats of any necessary Colorado permit requirements
- Development by Rocky Flats of treatment capacity for mixed waste residue
- Adequate characterization to verify the acceptability of the waste to the Rocky Flats treatment facility
- Agreement by the states involved

CHAPTER 5.0 HIGH-LEVEL MIXED WASTE

Days are defined as calendar days; Activities defined as occurring within a given quarter shall be completed by the last day of the quarter.

Section 5.1 Mixed Waste Streams for Which Technology Exists

5.1.1 Defense Waste Processing Facility (DWPF)

DWPF is the preferred option for the following waste streams:

SR-W016, 221-F Canyon High-Level Liquid Waste
SR-W017, 221-H Canyon High-Level Liquid Waste

Estimated Schedule for this onsite facility (target dates – not yet finalized)

Submittal of all applicable permit applications:
Completed

Entering into Contracts:
Completed

Initiating Construction:
Completed

Conducting Systems Testing: System testing shall be conducted 1st quarter FY96. Conducting system testing shall mean completion of nonradioactive test work and approval of DOE to commence radioactive operations.

Commencing Operations: Operations shall commence 3rd quarter FY96. Commencing operation shall mean initial transfer of high-level waste to the vitrification building (test FA 20.01).

Processing Backlogged and Currently Generated Mixed Waste: Provide schedule for processing backlogged and currently generated mixed waste within 120 days after commencing operations.

Schedule Assumptions

Upon the final determination of schedule for the DWPF, the ability to meet the schedule is contingent on the following:

- Receipt of adequate funding for this project to support the rate of progress
- Completion of the DWPF Supplemental EIS and issuance of a Record of Decision (ROD). Decisions reached following additional NEPA review are expected to be consistent with the activities specified in the schedule supplied. Selection of an alternate schedule may require the submittal of a revised proposal.
- Resolution of any finding(s) that might result from an operational readiness self-assessment
- Supporting high-level waste management processes/facilities, such as In-Tank Precipitation, evaporation, Late Wash, etc., will not impact DWPF waste processing. These processes are anticipated to support the commencement of DWPF operations by the Commence Operations date.

Volume II

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CHAPTER 1 INTRODUCTION

Section 1.1 Purpose and Scope

The Department of Energy (DOE) is required by Section 3021(b) of the Resource Conservation and Recovery Act (RCRA), as amended by the Federal Facility Compliance Act (FFCAct), to prepare plans describing the development of treatment capacities and technologies for treating mixed waste. The Act requires site treatment plans (STPs) to be developed for each site at which DOE generates or stores mixed waste. Mixed waste is defined by the FFCAct as waste containing both a hazardous waste subject to RCRA and a source, special nuclear or byproduct material subject to the AEA of 1954. The Draft Site Treatment Plan (DSTP), the second phase of treatment plan development as committed by DOE in the April 6, 1993 Federal Register, will be submitted to the State of South Carolina for review and comment before being further developed as the Final Site Treatment Plan (FSTP). The U. S. Environmental Protection Agency (EPA) and other stakeholders will receive copies of the DSTP for review.

The purpose of this DSTP is to identify the currently preferred options for treating the Savannah River Site's (SRS) mixed waste or for developing treatment technologies where technologies do not exist or need modification. The DSTP site-specific preferred options, developed with the state's input and based on existing available information. The options reflect the "bottoms-up" approach and have not been completely evaluated for impacts on other DOE sites and impacts to the overall DOE program. Therefore, changes in the preferred option and associated schedules are possible between the Draft Plan, the Final Proposed Plan, and final approval and issuance of the Compliance Order as evaluation of DOE-wide impacts and State-to-State discussions progress.

To the extent possible, the DSTP identifies specific treatment facilities for treating the mixed waste and proposes schedules as set forth in the FFCAct. When not possible, schedules for alternative activities such as waste characterization and technology assessment are provided as appropriate. All schedule information presented is preliminary and is subject to change. For new facilities, the schedule is heavily dependent upon decisions made during the design phase and is contingent on funding availability. Assumptions and professional judgments related to the type of treatment technology, location of the treatment facility, contracting mechanism, project approval process, cost, etc. were used to develop the estimated schedule. Any variation from these assumptions will impact the estimated schedule. In addition, cost data used in developing options and schedules and provided in the DSPT planning estimates only and do not reflect a commitment of budgetary resources.

Emerging or new technologies not yet considered may be identified in the future that provide opportunities to manage waste more safely, effectively, and at lower cost than the current technologies identified in the DSTP. Working closely with regulators and other interested parties during the implementation of the DSTP, DOE will continue to evaluate and develop technologies that offer potential advantages in the areas of public acceptance, risk abatement, and performance and life cycle cost. Should more promising technologies be identified, DOE may request a modification of its treatment plan in accordance with provisions of the FSTP and/or the Compliance Order.

The DSTP reflects the results of discussion among states, EPA, DOE and others based on the Conceptual Site Treatment Plan (CSTP) submitted to the State of South Carolina in October 1993. The CSTP presented several treatment needs, capabilities, and preliminary options for treating mixed waste at SRS. The DSTP narrows the broad range of options presented in the CSTP and presents SRS' preferred option for treatment of each waste stream.

Volume II, the "Background Volume" provides a detailed discussion of the preferred option with technical basis, plus a description of the specific waste stream. It provides the background and explanatory information for Volume I, the "Compliance Plan Volume,"

which identifies the capacity to be developed and the schedules as required by the FFCAct. Supplemental information is found in Appendix A.

All the waste streams listed in the Mixed Waste Inventory Report (MWIR) have been included in Volume II, the Background Volume. However, only the waste streams which require a schedule and a compliance order will be found in Volume I, the Compliance Plan Volume. Waste streams not found in Volume I have been recharacterized, combined, or are in compliance with applicable regulations. The lists below provide the status of the waste streams regarding their presence or absence from Volume I and justification for waste streams not included in Volume I.

SRS Mixed Waste Streams included in Volume I.

SR-W001	Rad-Contaminated Solvents
SR-W002	Rad-Contaminated Chlorofluorocarbons
SR-W003	Solvent Contaminated Debris (LLW)
SR-W004	M-Area Plating Line Sludge from Supernate Treatment
SR-W005	Mark 15 Filter Cake
SR-W009	Silver Coated Packing Material*
SR-W010	Scintillation Solution
SR-W011	Cadmium Coated HEPA Filters*
SR-W012	Toxic Cleanup Material
SR-W013A	Low-Level Waste Lead (Uncombined Elemental Lead)*
SR-W013B	Low-Level Waste Lead (Combined Lead)*
SR-W014	Tritiated Mercury*
SR-W016	221-F Canyon High-Level Liquid Waste (HLW)
SR-W017	221-H Canyon High-Level Liquid Waste (HLW)
SR-W018	Filter Paper Take Up Rolls*
SR-W022	Defense Waste Processing Facility (DWPF) Benzene
SR-W025	Solvent Waste <100 nCi/g TRU*
SR-W028	Mark 15 Filter Paper – F006*
SR-W029	M-Area Sludge Treatability Samples
SR-W030	Spent Methanol Solution
SR-W031	Uranium/Chromium Solution*
SR-W033	Thirids Waste <100 nCi/g TRU*
SR-W034	Calcium Metal*
SR-W035	Freon 11/Oil
SR-W036	Radioactive Oil *
SR-W037	M-Area High Nickel Plating Line Sludge
SR-W038	Plating Line Sump Material
SR-W039	Nickel Plating Line Solution
SR-W041A	Aqueous Mercury and Lead*
SR-W041B	Elemental Liquid Mercury*
SR-W041C	Mercury Contaminated Recorder*
SR-W042	Paints and Thinners*
SR-W043	Lab Waste w/Tetraphenyl Borate*
SR-W045	Tributyl Phosphate & n-Paraffin*
SR-W048	Waste Sites/Spill Site Soil*

SR-W049	Tank E-3-1 Clean Out Material*
SR-W051	Spent Filter Cartridges*
SR-W053	Rocky Flats Incinerator Ash*
SR-W055	Job Waste Containing Solvent Contaminated Wipes*
SR-W056	Job Waste with Enriched Uranium and Solvent Applicators*
SR-W059	Tetrabutyl Titanate (TBT)*
SR-W060	Tritiated Water with Mercury*

Waste streams marked with an * are to be included in Volume I but will have schedules submitted at a later date.

Waste streams that will not appear in Volume I and II because they have been recharacterized.

SR-W021	Poisoned Catalyst Material
SR-W040	M-Area Stabilized Sludge
SR-W052	Cadmium Contaminated Glovebox Section
SR-W057	D-Tested Neutron Generators

Waste streams that will not appear in Volume I because they have been consolidated with other waste streams.

SR-W019	244-H RBOF High Activity Liquid Waste
SR-W044	Tributyl Phosphate & n-Paraffin – TRU
SR-W054	Enriched Uranium Contaminated with Lead

Waste streams that will not appear in Volume I because they are in compliance.

SR-W007	SRL (SRTC) Low Activity Waste	Sufficient LDR capacity available
SR-W008	SRL (SRTC) High Activity Waste	Sufficient LDR capacity available
SR-W015	Mercury Contaminated Equipment	Meets LDR treatment standard Treated as a 90-day generator
SR-W020	In-Tank Precipitation (ITP) Filters	Meets LDR treatment standard via a treatability variance
SR-W023	Safety Control Rods	Meets LDR treatment standard Treated as a 90-day generator
SR-W024	Gold Traps	Meets LDR treatment standard
SR-W032	Mercury Contaminated Heavy Water	To be recycled by 10/95
SR-W046	Consolidated Incinerator (CIF) Ash	LDR treatment will be provided as part of the CIF operation
SR-W047	Consolidated Incinerator (CIF) Blowdown	LDR treatment will be provided as part of the CIF operation
SR-W050	Mixed Waste to Support HL Waste Processing Demonstrations	Treated in 90-day containment building
SR-W058	Mixed Sludge Waste with Mercury-DWPF Treatability Studies	To be treated in a satellite accumulation area

Waste streams that will not appear in Volume I because they are TRU waste scheduled for disposal at WIPP which will be pretreated to meet WIPP Waste Acceptance Criteria.

SR-W006	Mixed TTA/Xylene
SR-W026	Thirds TRU Waste
SR-W027	Solvent TRU Waste

Section 1.2 Site History and Mission

1.2.1 Role of the Savannah River Site

The SRS was established by the United States Atomic Energy Commission (USAEC) in 1950 to produce and recover nuclear materials (primarily tritium, Plutonium-239, and highly enriched uranium fuel) for national defense, medical use, and space mission heat sources (Plutonium-238). Most of the nuclear materials produced at the SRS were used for the production of components for nuclear weapons necessary for the national defense in accordance with DOE authority and responsibility under the Atomic Energy Act (AEA). Figure 1 shows the general location of SRS. The SRS is owned by the U. S. government and is operated by the DOE through management and operating contracts.

Recent site mission changes have reduced the need for nuclear material production at SRS and heightened the need for waste site environmental restoration and decontamination and decommissioning (D&D) activities. However, there will be continued operation of the tritium, separations, and certain plutonium operations, as well as analytical support activities.

Tritium requirements and the need for special isotopes such as Plutonium-238 dominate anticipated demand for separations operations for nuclear materials processing through at least the mid-1990s. SRS is the sole source of tritium, which is required to maintain the nuclear weapons stockpile. Recycling and reloading of tritium is a continuing site mission. Another mission for SRS is the processing of Plutonium-238, which is used in radioisotopic thermal generators to provide electrical power for space missions.

Existing plutonium bearing materials are being stored safely at SRS awaiting final disposition. A final decision may require resumption of operations of SRS plutonium processing lines.

1.2.2 SRS Principal Operations

SRS produces nuclear materials by manufacturing fuel and target components, irradiating the components in nuclear reactors, and chemically extracting the desired nuclear materials from the irradiated fuel and targets. SRS comprises numerous facilities including: production, production support, research and development, and waste management.

The largest SRS facilities are for production. These facilities include the fuel and target component manufacturing complex in M-Area, the production reactors, located in P, K, L, C, and R-Areas and the separations process lines in F- and H-Areas. The production facilities of M-Area and the reactors are not operating at this time. Separations facilities are fully operational but have been selectively operated recently depending on the need. At present, HB-Line is in operation to provide Plutonium-238 in support of the National Aeronautics and Space Administration (NASA).

The following paragraph describes the operations that have been the major contributors of mixed waste generated at SRS.

Preparation of target and fuel assemblies for the reactors was done in M-Area. This process was similar to a commercial metal forming and finishing operation. The process employed lithium/aluminum and uranium alloys and involved nickel electroplating on slightly enriched or depleted uranium. Aluminum forming and dissolution of aluminum cladding

from damaged cores also was done. Mixed wastes were generated from the electroplating operations and the generation of nickel plating solutions after M-Area metal forming and finishing facilities were shut down.

Plutonium, uranium, neptunium, and tritium can be recovered in the Separations areas. The major types of radionuclide recovery are the following: Plutonium-239 (Pu^{239}) recovery using the Plutonium Uranium Extraction (PUREX) solvent extraction process initiated in the F-Canyon and completed in FB-Line; Plutonium-238 (Pu^{238}) recovery using the Frames ion-exchange process initiated in H-Canyon and completed in HB-Line; Uranium-235 (U^{235}) and Neptunium-237 (Np^{237}) recovery in H-Canyon using the modified PUREX process; and tritium recovery in the H-Area Tritium Facility. In F-Canyon, uranium and plutonium recovery involves chemical dissolution of the irradiated components. Uranium and plutonium can be isolated from fission products in the first solvent extraction cycle. The uranium and plutonium are separated and an additional removal of fission products occurs in a second solvent extraction cycle. In H-Canyon, U^{235} can be recovered to make new reactor fuel enrichment material. Also in H-Canyon, neptunium can be recovered from the U^{235} process and reprocessed into an oxide for reactor targets. Following irradiation and conversion of some fraction of the Np^{237} to Pu^{238} , the Np^{237} can be recovered for recycling in the H-Canyon Frames process. The liquid high-level waste remaining after the nuclear materials are recovered in both canyon facilities is made alkaline (pH 10-13) and transferred by gravity to the F- and H-Area High-Level Radioactive Waste (HLW) Tank Farms. High pH is maintained to prevent corrosion of the carbon steel tanks.

Figure 1 – General Location of Savannah River Site

Tritium is recovered in a separate complex of buildings in H-Area. Tritium is extracted by heating irradiated lithium-aluminum targets, extracting gases under a vacuum, and separating the tritium from other hydrogen and helium isotopes. The nuclear materials are shipped to other DOE facilities for additional processing.

SRS also contains many production support and research and development facilities including powerhouses, laboratories, administrative and support facilities. Figure 2 shows the location of major production, support, and research and development areas at SRS.

SRS Principal Mixed Waste Facilities

The existing facilities that manage mixed waste are the F- and H-Area high-level waste (HLW) Tank Farms, the F/H Effluent Treatment Facility (ETF), the M-Area Liquid Effluent Treatment Facility (LETf), the M-Area Process Waste Interim Treatment/Storage Facility (PWIT/SF), the Mixed Waste Storage Shed (Building 316-M), the Savannah River Technology Center (SRTC) Mixed Waste Storage Tanks (MWST), Solvent Storage Tanks (23-30), the Transuranic (TRU) waste storage pads, the Mixed Waste Storage Buildings (MWSB) (Buildings 645-2N, 643-29E, and 643-43E), the Defense Waste Processing Facility (DWPF) Vitrification Facility, the DWPF Organic Waste Storage Tank (OWST), and the Z-Area Saltstone Processing Facility. Additional treatment and storage is presently under construction at the Consolidated Incineration Facility (CIF). A permit application has been submitted for the M-Area Vendor Treatment Process. The listed facilities have been proposed, designed or constructed to store and/or treat the major mixed waste streams generated at SRS.

The M-Area LETf is an industrial wastewater treatment plant which has been designed to precipitate, filter and discharge the treated filtrate from wastewater generated by the target and fuel assembling activities in M-Area. The M-Area Vendor Treatment Process, when permitted and operational, will stabilize the treated sludge from M-Area into a glass matrix by a vendor operated vitrification process.

Liquid high-level radioactive waste (HLW) generated by the separations facilities is stored in underground tanks in the F- and H-Area HLW Tank Farms. Waste must be stored prior to treatment to allow radioactive decay to reduce the radionuclide contamination to a safer level for processing. To reduce the volume of HLW in storage, the liquid waste containing metal, salts and fission products from reactor processing is routed through evaporators. The evaporator overheads are piped to the F and H ETF where they are treated by a series of physical/chemical treatment steps which include pH adjustment, submicro filtration, reverse osmosis and ion exchange. Treated effluent is discharged to surface water as authorized by a National Pollutant Discharge Elimination System (NPDES) permit. This system also treats contaminated cooling water and storm water releases.

Treatment residues from the F and H ETF processes and the low-level radioactive portion (decontaminated salt solution) of the high-level liquid radioactive wastes in the F- and H-Area Tank Farm are treated in the Z-Area Saltstone Processing and Disposal Facility. This waste stream is mixed waste due to its corrosivity and potential to exceed the Toxicity Characteristic Leaching Procedure (TCLP) limits for chromium. The waste stream is stabilized by mixing with grout and flyash to create saltstone. The non-hazardous saltstone is disposed in the Z-Area Vaults.

The remainder of the high-level waste, salt slurry, and sludge, will be mixed with glass frit and stabilized in borosilicate glass at the DWPF.

The CIF is a rotary kiln incinerator attached to a cement stabilization unit for ash processing. A portion of its capacity will be used to treat organic solid and liquid mixed waste generated by various activities at SRS. One waste stream proposed for treatment in the CIF is benzene generated by pretreatment processes for DWPF. The benzene is stored in the OWST at DWPF for eventual treatment at CIF. The CIF is currently under construction.

Another treatment facility at SRS is the SRTC MWST, where high and low activity waste streams from SRTC undergo neutralization and ion exchange to remove hazardous characteristics before receiving further processing at the F-Area Tank Farm.

Mixed wastes are stored on the TRU pads, in the MWSB, in storage tanks, in the PWIT/SF Tanks, and the Mixed Waste Storage Shed until they can be sent to the appropriate treatment and disposal facilities.

The site treatment plan will analyze treatment options for mixed waste using these facilities with and without modifications, and will investigate other options for treatment of mixed waste streams generated at SRS.

Figure 2 - Location of Major Production, Support, and Research and Development Areas at the Savannah River Site

Section 1.3 Framework for Developing DOE's Site Treatment Plan

RCRA Land Disposal Restrictions (LDR) require the treatment of hazardous waste (including the hazardous component of mixed waste) to certain standards before land disposal, and with limited exceptions, prohibits storage of hazardous wastes that do not meet LDR standards. DOE currently is storing mixed waste because the treatment capacity for such wastes, either at DOE sites or in the commercial sector, is inadequate or unavailable. Some DOE facilities, such as SRS, have negotiated an agreement with the EPA that allows continued storage for LDR mixed waste until treatment capacity is constructed. However, agreements that do not include the states, such as the SRS Land Disposal Restriction Federal Facility Compliance Agreement (LDR-FFCA), must be replaced by compliance orders required by the FFCAct. Such agreements may be bridged or merged into the site treatment plan schedules required by the FFCAct. However, language in the SRS LDR-FFCA states that it will no longer be in effect after October 6, 1995, the date listed in the FFCAct for developing a Compliance Order, unless the SCDHEC and DOE-SR jointly request an extension. Therefore, SRS is developing a site treatment plan and will execute an Compliance Order with the state of South Carolina to comply with the FFCAct.

The FFCAct requires DOE to prepare a plan for developing the required treatment capacity for mixed waste for each DOE site storing, generating, or expecting to generate mixed waste. Plans prepared by each DOE facility shall be reviewed by the host State or EPA, with consultation provided by other affected states. If the plan is approved, an order shall be issued requiring compliance. The states have the option to approve the plan presented by their DOE site, approve the plan with modification, or disapprove the plan. If the plan is approved and an order is signed between the state and the DOE facility, the Act provides that DOE will not be subject to fines and penalties for LDR storage prohibition violations for mixed waste as long as it remains in compliance with the approved plan and order.

The FFCAct specifies that the site treatment plans must provide a schedule for developing the necessary treatment capacity. For mixed waste without an identified treatment technology, the plan must include a schedule for identifying and developing treatment technologies. The FFCAct also requires the plan to address wastes for which DOE proposes radionuclide separation. The Act states that the plans may provide for centralized, regional or onsite treatment of mixed waste, or any combination thereof, and requires the states to consider the need for regional treatment facilities in reviewing the plans.

The "Schedule for Submitting Plans for the Treatment of Mixed Waste Generated or Stored at Each Site," as required by the Act, was published April 6, 1993 in the Federal Register (58 FR 17875). The published schedule specifies that DOE sites will provide the site treatment plans in three phases: the first phase entitled "Conceptual Site Treatment Plan" was issued on October 30, 1993. The second phase, the "Draft Site Treatment Plan," as described in the succeeding chapters, requires issuance no later than August 31, 1994. A "final proposed plan" now called the FSTP will be issued in February 1995. This process provides opportunity for early involvement by the states and other stakeholders to discuss technical and equity issues associated with the plans.

The CSTP focused on identifying treatment needs, capabilities, and options for treating the site's mixed wastes. This DSTP focuses on identifying preferred options for treating the site's mixed wastes whenever possible, as well as proposed treatment schedules for treating existing stored mixed waste, and mixed waste expected to be generated in the next five years. The options represent the site's best judgment from available information and should be viewed as a starting point for discussions leading to the development of the FSTP, which will be submitted to the regulatory agency for review and approval, approval with modification, or disapproval, as required by the FFCAct. Each version of the site treatment plan will reflect discussions among the states, as well as site specific input on the previous submittal from the individual regulatory agency and other interested parties. It is DOE's intent that this iterative process, with ample opportunity for input and discussion, will facilitate approval of the site

treatment plan and issuance of the Compliance Order addressed in the Act. DOE's goal is to have all plans approved and the Compliance Order in place by October 1995.

Section 1.4 DSTP Organization

This DSTP was developed using guidance provided by DOE-HQ and follows the recommended format so the appearance and organization of the DSTP will be similar among DOE sites. This common format will facilitate cross-site comparisons.

The DSTP appears in two volumes and an appendix. Volume I, called the Compliance Plan Volume, is a short, focused document containing the preferred options and schedules for implementing the treatment for SRS mixed waste requiring a Compliance Order. It is intended to contain all the information required by the FFCAct. An introductory chapter is devoted to a discussion of the purpose and scope of the Compliance Plan Volume. There also is a chapter presenting the DOE proposal for an approach to setting milestones, updating the Compliance Plan Volume, adding or removing waste streams and addressing funding considerations. These chapters are intended to initiate discussions. It is expected that specific language, which may eventually be expanded to address other administrative provisions or incorporated into a separate Compliance Order, will be developed in conjunction with the regulatory agency.

Volume II is called the Background Volume. Within this volume are the details regarding the process, rationale, and uncertainties associated with the identification of a preferred option for each waste stream, as well as budget status for the option. Supplemental technical information is found in Appendix A. Chapter 1 of Volume II contains general information on the DSTP and the site, and provides development assumptions. Description of the development methodology used in determining the preferred options is found in Chapter 2.

The contents of the remaining chapters and appendices for Volume II are found below.

Chapters 3.0 through 5.0 discuss the preferred options for management of mixed low-level waste, TRU mixed waste, and high-level mixed waste. The organization of waste streams in each radiological category is identical in Volumes I and II for consistency. In Volume I, these same chapters identify preferred options and, to the extent feasible, proposed schedules as required under the FFCAct.

Volume II includes four additional sections that are not included in Volume I. Chapter 6 discusses mixed wastes expected to be generated from future activities such as environmental restoration and decontamination and decommissioning actions. These waste streams will be incorporated into Volume I, and treatment approaches and schedules developed, when the wastes are generated. Chapter 7 discusses storage capacity needs, compliant storage is provision, and information on projected storage needs.

Chapter 8 describes a process that is being followed by DOE and the states for evaluating options for disposal of mixed waste treatment residues. Information regarding disposal will be provided at a later date.

Chapter 9 provides information on requests from other DOE sites to have their mixed waste streams treated at SRS treatment facilities, and describes the evaluation process for these wastes, listing those waste streams that SRS has determined can be treated. This serves as a preliminary evaluation demonstrating that SRS can treat the waste, not as a determination that the waste will actually come to SRS for treatment. Also provided is a summary roll-up table of evaluations of the offsite waste volumes requesting treatment at each SRS treatment facility. This section also lists those wastes for which other sites have identified SRS treatment facilities as the preferred treatments in their DSTPs. Final decisions on actual treatment will be made by the requesting DOE site, SRS, DOE-HQ, affected states, and other

stakeholders in the course of negotiations leading to the development of the FSTP and the Compliance Order.

The DSTP describes the options selection process detailed in Appendix A and describes the results of applying the "Draft Site Treatment Plan Development Framework." For each waste stream, Appendix A describes how options were evaluated and why the preferred option was selected. Appendix A also contains cost information developed to support the options analysis.

As prescribed in DOE DSTP development guidance and as requested by South Carolina, SRS has evaluated offsite treatment options for many of its waste streams. Information on evaluation of SRS waste streams for treatment by other DOE sites is presented in Appendix A.

Section 1.5 Evolving Technologies

The SRS "Vendor Information Exchange Forum" resulted in the submission of hundreds of proposals for mixed waste treatment options. Engineering assessment of the proposals identified viable treatment options, which then underwent in-depth options analysis (IDOA) to determine their applicability to onsite waste streams. The results of these IDOAs appear in Section 3.0 of Appendix A of the DSTP.

Other agencies also have conducted surveys to find vendors with some potential capability, or at least an expressed desire, to treat DOE mixed waste. These reports have been assessed and the new information relevant to SRS is summarized in Table 1.

None of the vendors listed in Table 1 have developed mixed waste treatment technology sufficiently well to warrant IDOA at this time. All would be eliminated from further consideration as viable options by:

- Low Technology Success Factor (see Section 2.2.2) due to process immaturity,
- Need for extensive research to determine applicability to mixed waste
- Inappropriateness for SRS waste streams (e.g., designed to treat large volumes of waste water).

Exclusion of these vendors and their unproved technologies from consideration in the DSTP now does not mean that they are without merit. As the technologies mature, they may well offer waste treatment alternatives superior to the proven methods necessarily recommended by DSTP.

Table 1
Potentially Meritorious Treatment Technologies
(Abstracted from Literature)

Information Sources Used:

- 1 DOE Offsite Fact Sheet
- 2 DOE Technology Connection Program
- 3 EG&G *Review of Private Sector Treatment, Storage, and Disposal Capacity for Radioactive Waste Report*
- 4 Sandia Laboratories *Survey of Mixed Waste Treatment Technologies for Mobile Treatment*

Vendor	Waste	Treatment Technology	Info. Source	Comments
Advanced Recovery Systems, Inc.	Mercury contamination	Mercury removal	3	Pilot scale process.
Alternative Remedial Technologies, Inc.	Contaminated soil	Soil washing	4	Pilot scale process.

Vendor	Waste	Treatment Technology	Info. Source	Comments
Analytical Development Corp.	Wastewater with TRU and heavy metals	Precipitation and clarification	2	Pretreatment. Sludge produced requires stabilization by some other method.
Andco	Wastewater with metals	Electrolysis	2	Main use is treatment of contaminated groundwater.
Atomic Energy of Canada, Inc.	Heavy metal and uranium contaminated solvents	Unspecified	4	Pilot scale process.
Atomic Energy of Canada, Inc.	Organic and aqueous mixed waste solutions	Resin adsorption and stabilization	4	Pilot scale process.
Eichrom Industries, Inc.	Actinides in acidic solution	Resin adsorption	4	Pilot scale process for mixed waste treatment.
Envirocare of Utah, Inc.	Solid mixed wastes	Stabilization	1	Disposal facility.
Environmental Engineering and Technology	Solid mixed waste	Microwave vitrification	2	Demonstration phase of development
EPOC Water, Inc.	Aqueous suspensions	Microfiltration	4	Water recovery technology. Solids remain in low concentration.
Filter Flow Technology, Inc.	Secondary wastewater from soil washing	Filtration	2	Demonstration process for DOE wastes. Post-treatment for soil washing.
H2O Inc.	Wastewater with metals or VOC	Ozonation	2	Bench scale process.
Hnat	Liquids and solids	Vitrification	4	Pilot scale process.
Hydro-Tek, Inc.	Organic contaminated soil	Roast and retort	4	Does not address radioactive contaminant.
Isotron Corp.	Soil contaminated with metals	Metal migration	2	Bench scale process. Metal migration technology in a containment building was evaluated and rejected (q.v.).
Memtek Corp.	Secondary wastewater from soil washing	Filtration	2	Post-treatment for soil washing.
Molten Metal Technology, Inc.	Waste contaminated with metals, or waste metals	Reduction furnace	2	No radioactive waste experience.
Resource Conservation Co.	Organic contaminated soil and sludge	Solvent extraction	2	Pilot scale process for organic decontamination.
Rockwell International Corp. Rocketdyne Div.	Organic mixed wastes	Molten salt incineration	4	Pilot scale process.
Rust Remedial Services	Contaminated soil	Metal migration	2	Metal migration technology in a containment building was evaluated and rejected.

Vendor	Waste	Treatment Technology	Info. Source	Comments
Rust Remedial Services	Wastewater	Adsorption and magnetic separation	2	Pilot scale process.
Technology Innovation Development Engineering, Inc.	Contaminated finely divided solids	Cement/ flyash encapsulation	2	Bench scale process.

Section 1.6 Documents and Activities Related to DSTP Development

Other DOE efforts are closely linked to the STP development. These include the Mixed Waste Inventory Report (MWIR), activities conducted pursuant to the National Environmental Policy Act (NEPA) and other planning and management actions, and compliance and cleanup agreements containing commitments relevant to treatment of mixed waste.

Mixed Waste Inventory Report

The MWIR, required by the FFCAct, provides an inventory of mixed waste currently stored, generated, or expected to be generated over the next five years at each DOE site, and an inventory of treatment capacities and technologies. The Interim MWIR, published by DOE in April 1993, provided information on each mixed waste stream generated or stored by the DOE sites. DOE made updated waste stream and technology data available to the states and EPA in May 1994. The MWIR represents the DOE's mixed waste inventory as of September 1993.

The DSTP reflects the most current and accurate data on the waste streams and technology needs and, as a result, there may be some differences between the DSTP and the MWIR. Any differences will be noted and explained. In general, these differences result from refinements of volume estimates for existing and future projections of mixed waste generation, as better information on stored waste or more accurate estimates of future waste generation have become available. Other differences have to do with mixed waste streams that have been combined or deleted. Investigation disclosed that three waste streams could be combined with other, similar wastes, thus making treatment simpler. Also, four deleted waste streams are identified and discussed briefly in the DSTP. Future waste streams to be included in the next MWIR data collection are discussed in Chapter 6.

The National Environmental Policy Act (NEPA)

NEPA requires federal agencies to assess and address environmental impact of their activities and consider alternative actions. NEPA requires detailed Environmental Impact Statements (EIS) for major federal projects. Smaller activities require Environmental Assessments (EA) while other routine activities can be excluded from NEPA review under the Council on Environmental Quality (CEQ) and DOE regulations. NEPA provides for public review of, and input to, federal actions. The status of SRS facilities under NEPA is indicated below.

A number of facilities designed to treat mixed waste are in various stages of planning, design, permitting or construction at SRS. The DWPF is permitted, constructed, and undergoing testing and modification in preparation to operate. The CIF is permitted and under construction. The M-Area Vendor Treatment Process is in an advanced planning stage and has submitted a permit application. The Hazardous Waste/Mixed Waste Treatment Building (HW/MW-TB) and the Transuranic Waste Facility (TWF) are in preliminary planning stages. As a part of the planning process, these facilities have undergone and continue to undergo review under NEPA.

While there is no sitewide EIS for SRS, the EIS for Waste Management Activities for Groundwater Protection at SRP (DOE/EIS-0120), prepared in 1987, addressed sitewide waste management issues. An analysis of the need to prepare a supplement to the EIS also has recently been completed. Existing, planned, and proposed mixed waste treatment facilities have been and are being addressed under NEPA. Summary information providing a NEPA status on mixed waste treatment facilities is provided below:

Defense Waste Processing Facility (DWPF): An EIS and Record of Decision (ROD) were published in 1982 documenting the decision of the DOE to construct and operate DWPF. Since then, DOE has modified the DWPF process and facilities to improve efficiency and safety. DOE-SR has prepared a Supplement Analysis and forwarded it to DOE-HQ (EM). From this information, EM has recommended that a Supplemental EIS (SEIS) be completed.

This SEIS will examine the environmental impacts of the modifications made to the DWPF and associated high-level waste facilities at SRS, and will allow DOE to determine whether the decisions reached as a result of the 1982 EIS and subsequent EA remain valid in light of process and facility modifications made over the last 12 years.

The DWPF modifications in the Notice of Intent (NOI) to file the EIS include the following: In-Tank Precipitation (ITP), Saltstone Processing and Disposal, the Late-Wash Facility addition, nitric acid introduction, ammonia mitigation modification, hydrogen modifications, and benzene treatment. The SEIS will evaluate additional modifications that may result from the need to mitigate cumulative impacts, or to further enhance safety and efficiency.

Consolidated Incineration Facility (CIF): An EA was completed and a Finding of No Significant Impact (FONSI) issued in December 1992.

Transuranic Waste Facility (TWF): This two-phase project is in the planning stages. Phase one includes the retrieval of stored TRU waste drums and plans for constructing the Low Activity Transuranic Facility (LATF). Phase two would include planning for the High Activity Transuranic Facility (HATF). Phase one retrieval has been addressed in an EA completed in 1988 and a FONSI was issued in December 1988.

The LATF portion of phase one, and the HATF phase require a NEPA review. Specific NEPA requirements for these two phases are under review.

Hazardous Waste/Mixed Waste Disposal Facility Treatment Building (HW/MW-TB): This is also a planned project. There is no existing NEPA documentation for this facility.

M-Area Vendor Treatment Process: An EA has been prepared for this project. A FONSI was issued by DOE-HQ on August 1, 1994.

Waste Management Environmental Impact Statement (WM-EIS)

DOE-SR is preparing an EIS, called the WM-EIS, to provide a basis to select a sitewide strategy to manage present and future SRS waste generated from ongoing operations, environmental restoration activities, and decontamination and decommissioning activities. In selecting a sitewide SRS waste management strategy, technology development and waste minimization will be considered. In addition, the WM-EIS will provide a baseline for analyzing future waste management activities and evaluating specific waste management activities. DOE could, in turn, base supplemental EISs or EAs on this EIS, as necessary, to respond to future mission decisions, decontamination and decommissioning needs, and technological developments. The WM-EIS includes the investigation of existing mixed waste treatment facilities such as the F and H ETF, as well as facilities under construction or planned, including the CIF, HW/MW-TB, and the TWF. SRS is reassessing the NEPA activities performed for these facilities to determine whether, in light of changing DOE goals and missions, the decisions

made in regard to these projects remain appropriate. All No Action and Proposed Action decisions regarding these facilities will be evaluated in the WM-EIS. However, reassessment also could result in modified facilities.

Analysis of options for onsite treatment of SRS mixed waste streams developed by the STP will support the WM-EIS for mixed waste, and will be the foundation for EIS activities regarding mixed waste. In the unlikely event that detailed analysis in the WM-EIS determines that a treatment option identified in the STP is not appropriate due to a 30-year waste forecast in the WM-EIS compared to a 5-year waste forecast in the STP, identification of this fact will be promptly made and negotiations opened to discuss possible alternative treatment actions.

The Programmatic Environmental Impact Statement (PEIS) for Environmental Restoration and Waste Management

DOE-HQ is preparing a Draft Environmental Management Programmatic Environmental Impact Statement (PEIS) to support complex-wide integration of environmental management activities. The PEIS is intended to present to the public, states, and EPA an understanding of both the effects upon human health and the environment and the costs associated with a wide range of alternative strategies for managing the DOE's environmental program. The PEIS will address all waste types and activities, including issues associated with mixed waste treatment which are addressed in the STP.

Development of the Environmental Management (EM) PEIS is being coordinated with the preparation of STPs under the FFCAct. Information supporting the PEIS, such as hypothetical configurations, preliminary risk analysis, and cost studies, is shared with states in support of STP discussions. The draft PEIS will not identify a preferred alternative or configuration for mixed waste facilities since this will evolve in consultation with the states and EPA through the STP process. However, the PEIS analysis of potential environmental risks and costs associated with a range of possible waste management configurations will provide valuable insight as the public, states, and DOE discuss using existing facilities and/or locating possible future mixed waste facilities.

The PEIS is scheduled to be published in the fourth quarter of 1994. The final PEIS will be issued after the public comment period at or near the time of submission of the final STPs to the states or EPA for approval. To remain flexible and accommodate potential changes after submittal of the final STPs to the states and EPA, the ROD for the PEIS will be issued together with approval of the plans by the appropriate regulatory agency. Treatment analyses performed in the STP will be incorporated into the PEIS and the mixed waste portion of the WM-EIS. The STP will produce the preliminary work for these documents. DOE recognizes that actions for STP and NEPA activities must be closely coordinated. Decisions made by STP analysis will be carried forward in NEPA actions.

Environmental Restoration/Waste Management Five Year Plan

DOE's Office of Environmental Restoration and Waste Management (EM) uses a variety of interrelated planning initiatives to accomplish its mission. One of these is the Five-Year Plan (FYP). Updated annually, the FYP is the principal planning document for EM activities. The FYP identifies activities needed to accomplish EM's mission over the planning period. The SRS portion of the FYP is available as a part of the supporting data and documentation prepared for the DSTP and can be reviewed by interested parties.

Waste Management Plans

To provide tools for planning consistent with the SRS FYP but with further, more specific detail on waste management activities, SRS has developed waste management plans. These plans have been organized according to the type of waste being discussed. The Solid Waste Management Plan (WSRC-RP-93-1448) addresses planning for Sanitary Waste, Hazardous

Waste, Mixed Low-Level Waste, Low-Level Radioactive Waste, and Transuranic Waste. The High-Level Waste System Plan (HLW-OPV-94-0077) addresses planning for the High-Level Wastes which are liquid radioactive wastes and include high-level mixed wastes.

The purpose of the Solid Waste Management Plan is to present the recommended options for managing solid waste at SRS. The plan identifies the approximate funding and schedule requirements and the numerous issues and assumptions that must be addressed during implementation. The Solid Waste Management Plan has been developed to meet current and anticipated solid waste needs at SRS and provide a strategic plan for the treatment, storage, and disposal of SRS solid waste streams. It has been recognized that the strategy for mixed waste developed in the Solid Waste Management Plan is dependent on the development of the SRS STP and input into the STP by the regulatory agencies and other stakeholders. As a result, significant changes could be made to the mixed waste management strategy in the Solid Waste Management Plan. The plan will have the capacity to be revised to reflect changes as a result of the STP development as well as new regulatory developments, advances in technology, and funding changes.

The High-Level Waste System Plan provides the same long-range planning function for high-level waste as the Solid Waste Management Plan provided for solid waste. Mixed High-Level Waste treatment also will be affected by developments in the STP and the plan for high-level waste must reflect the changes brought about as the SRS STP is prepared and approved.

Compliance Agreements

There are two compliance agreements concerning mixed waste activities that exist between the SRS and the EPA and the South Carolina Department of Health and Environmental Control (SCDHEC).

The Land Disposal Restrictions Federal Facility Compliance Agreement (LDR-FFCA): The LDR-FFCA was entered into by EPA-Region IV (EPA-IV) and DOE-SR in order to provide a period for SRS to implement a treatment plan to address the generation, storage, and treatment of prohibited mixed waste which is presently stored or which, in accordance with and as of the effective date of the LDR-FFCA, will be generated, stored, and treated by the operation of the facilities at the SRS. The LDR-FFCA established a number of compliance deadlines or deliverables regarding LDR mixed waste treatment activities at SRS. Many of the deliverables involve planning, construction, and treatment schedules for mixed waste streams generated at SRS. As a result, this document serves as a driver for some mixed waste treatment presently at SRS. To align the LDR-FFCA with the requirements of the Federal Facility Compliance Act, EPA-IV and DOE negotiated a Bridging Amendment (3rd Amendment) to the LDR-FFCA, effective June 20, 1994. The amended LDR-FFCA will transition SRS commitments regarding mixed waste treatment until a compliance order is in place with the SCDHEC as required in the FFCAct. The LDR-FFCA could terminate at an earlier time if SCDHEC and DOE-SR sign a Compliance Order before October 6, 1995. The LDR-FFCA will terminate on October 6, 1995, or at a date requested jointly by SCDHEC and DOE-SR and agreed to by EPA-IV. For information on treatment schedules and requirements in the amended LDR-FFCA, the reader may consult the agreement document which is included in the support material for the DSTP available for review.

The Federal Facility Agreement (FFA): Section 120, Federal Facilities of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), requires that a federal facility placed on the National Priorities List (NPL) enter into an interagency agreement (FFA) with the EPA for the expeditious completion of all necessary remedial actions at the facility.

SRS has entered into an FFA with EPA-IV and SCDHEC which directs the comprehensive remediation of SRS. It details the method by which the three parties will interact in the process of remediating SRS. It directs the three parties in their respective responsibilities, and requires the parties to meet, discuss, and prepare schedules for the remediation. The FFA

contains requirements for the prevention and mitigation of releases or potential releases from the High-Level Radioactive Waste Tank Systems. It also affects environmental restoration activities at SRS which deal with mixed waste. It has not yet been determined how environmental wastes will be reflected in the final site treatment plan. DOE will continue discussions with the states and EPA to address this matter. A copy of the FFA is available with other DSTP document support material for review.

CHAPTER 2 METHODOLOGY

Section 2.1 Assumption and Definitions

2.1.1 Assumptions

DOE Assumptions

All sites used the following assumptions to provide a degree of consistency in the preparation of the DSTP. The assumptions were developed as a part of the "Draft Site Treatment Plan Development Framework" and reflect review and comment from the states and EPA.

1. High-level waste (HLW) will continue to be managed according to current plans at each site (i.e., Hanford, West Valley, Savannah River, Idaho National Engineering Laboratory). Primarily due to potential safety concerns, HLW will not be transported offsite except as a treated stable waste that is ready for disposal. The DSTPs will not change management strategies for HLW.
2. Regarding defense related TRU waste, the DSTPs will reflect DOE's current strategy on the WIPP opening and receipt of a No Migration Variance (NMV). A NMV is approved if the disposal facility can be shown to be protective of the environment. Wastes disposed in such a unit are not required to meet the LDR treatment standards. The DSTPs will identify characterization, processing, and treatment of TRU waste to meet the WIPP Waste Acceptance Criteria (WAC). Consistent with this policy, treatment of mixed TRU waste to meet LDR standards will not be included in the DSTPs.

However, the STPs will recognize that DOE's policy regarding WIPP is under review and may change in the future. As such, the STPs will provide for the flexibility to modify activities and milestones regarding TRU waste to reflect potential future changes in DOE policy.

Under current DOE policy, non-defense related TRU waste will not be disposed at WIPP. As such, the DSTPs should reflect LDR treatment of non-defense mixed TRU waste.

3. DOE recognizes some state's preference for treatment of all wastes onsite. Where appropriate, existing onsite capacity will be utilized before new facilities are constructed. When onsite treatment or use of commercial or mobile facilities is not practicable, the use of existing offsite capacity, as well as the construction of new facilities, will be considered.
4. Sites in the same state will investigate the practicality of consolidating treatment facilities.
5. Mixed waste resulting from Environmental Restoration (ER) and D&D activities will be factored into planning activities and equity discussions to the extent known, particularly where utilization of facilities in the DSTP are being considered for managing ER and D&D waste. The DSTP will propose a strategy for the inclusion of ER and D&D mixed waste streams.
6. The DSTPs will address all wastes in the updated MWIR. Any changes /corrections to the MWIR waste streams and treatment facility information will be explained in the DSTP.
7. On a volume basis, the large majority of DOE's mixed waste will be treated onsite. Because of transportation concerns and costs, this includes process wastewater and some explosives and remotely handled waste. In addition, other large volume waste streams generally will be treated onsite. At a minimum, Richland (RL), Oak Ridge (OR), Idaho

(ID) and Savannah River (SR) will have onsite facilities to treat the majority of their wastes.

8. The PEIS is being performed in parallel with the development of the STPs. The DSTP process will provide information to the PEIS. Each site will prepare any necessary specific NEPA documentation before proceeding with a given project or facility required by the state or EPA as a result of the STP process.
9. In support of DOE's cradle to grave waste management philosophy, disposal site location and criteria will be factored into state equity discussions, waste treatment facility designs, and the characteristics of the final waste forms.

SRS Assumptions

In addition to the general DOE complex-wide assumptions, SRS developed site specific assumptions for use in developing the DSTP. These assumptions are listed below:

1. To the extent possible, all waste streams in the Mixed Waste Inventory Report will have a preferred treatment option identified and/or option analysis complete in the DSTP. Those waste streams without a preferred treatment option will have a schedule for the development of the preferred option.
2. All Savannah River Site high-level waste will be treated onsite.
3. ER, Transition, and D&D waste streams will be addressed in the Draft Site Treatment Plan to the extent that they are known. ER waste streams from Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) sites will not be analyzed in the site treatment plan until a Record of Decision has been received for the particular remediation project. Known waste streams from Resource Conservation and Recovery Act (RCRA) waste sites will be addressed. Methodology for modifying the Draft Site Treatment Plan for new ER, Transition, and D&D waste streams will be incorporated into the text of the document. SRS is negotiating the classification of Investigation Derived Waste (IDW). IDW is not anticipated to be included in the DSTP.
4. If existing onsite treatment capacity is available for a particular waste stream, no further analysis will be performed for that waste with the exception of waste streams going to the CIF. In order to be responsive to stakeholders, alternatives to incineration are being addressed. Existing mixed waste treatment facilities are those facilities at Savannah River Site that are either 1) presently operating or 2) under construction (i.e., having been issued regulatory operating or construction permits). Existing mixed waste treatment facilities at the Savannah River Site include, Savannah River Laboratory High Activity and Low Activity Treatment Tanks, M-Area Liquid ETF, F- and H-Area ETF, and Z-Area Processing Facility. Mixed waste treatment facilities under construction with appropriate environmental permits at SRS include DWPF and CIF. Existing non-RCRA disposal facilities include the E-Area Vaults and the Z-Area Saltstone Disposal Vaults.
5. Treatment options analysis will not be included in the DSTP for the six original streams to be treated by the M-Area Vendor Treatment Process. Options analysis was conducted previously and resulted in the selection of this treatment process which produces a superior waste form. Additionally, this is a temporary vendor facility and may operate for less than 5 years. Other SRS waste streams for which this technology is appropriate treatment will be considered.
6. Treatment schemes such as treatment in containers or containment buildings will be investigated.
7. The DSTP will not address moratorium waste in the preferred option analysis process.

8. The level of detail for option analysis will vary in the DSTP from waste stream to waste stream.
9. The five year window for waste forecasting will continue to be used as established in the final MWIR (1993 through 1997).
10. Cost and schedule analyses will be performed for the viable options only. Viable options are those which in-depth technical analyses have determined present a reasonable potential to become the preferred treatment option for that waste stream.
11. Determination of viable options for in-depth option analysis to determine the preferred option will be limited to options which meet the LDR requirements.
12. In all relevant DSTP flow diagrams, after the waste has been removed from the containers, the containers will be considered "empty" according to 40 CFR 261.7, thus requiring no treatment.
13. Waste stream letter suffixes (e.g., SR-W041A, SR-W041B, etc.) designate separate and distinct waste streams.

2.1.2 Definitions

There are several disciplines dealing with the treatment of mixed waste at DOE facilities with which the DSTP must interact. To assist the reader in dealing with the specialized language found in the DSTP, the following definitions are provided.

Amalgamation (AMLGM) – A process applicable to radioactive wastes containing mercury and particularly to wastes containing radioactive mercury isotopes. Mercury compounds are converted into a solid alloy with mercury and the amalgamating material, which is more easily managed and less mobile than solutions containing radioactive mercury. Amalgamation provides a significant reduction in air emissions of mercury and provides a change in mobility from liquid mercury to a paste-like solid, potentially reducing leachability. Amalgamation may be performed using any of the following elements: zinc, copper, nickel, gold, and sulfur.

Aqueous Liquids (as a waste matrix) – Liquids/slurries with a total organic carbon (TOC) content less than 1 percent. Slurries must be pumpable (e.g., suspended/settled solids can be up to approximately 35-40 percent). Only liquids/slurries packaged/stored in bulk form (i.e., tank stored, drummed bulk free liquids) are included in this category. Liquids packaged in lab pack-type configuration are categorized as lab packs.

Best Demonstrated Available Technology (BDAT) – To determine BDAT, EPA examines all available performance data on technologies that are identified as demonstrated to determine (using statistical techniques) whether one or more of the technologies performs significantly better than the others. The technology that performs "best" on a particular waste or waste treatability group is then evaluated to determine whether it is "available." To be available, the technology must (1) be commercially available to any generator and (2) provide "substantial" treatment of the waste, as determined through evaluation of accuracy-adjusted data. In determining whether treatment is substantial, EPA may consider data on the performance of a waste similar to the waste in question, provided that the similar waste is at least as difficult to treat. If the best technology is found to be not available, then the next best technology is evaluated, and so on.

Biodegradation (BIODG) – The degradation of organics or non-metallic inorganics (i.e., inorganics that contain phosphorous, nitrogen, and sulfur) in units operated under either aerobic or anaerobic conditions such that a surrogate compound or indicator parameter has

been substantially reduced in concentration in the residuals (e.g., Total Organic Carbon can often be used as an indicator parameter for the biodegradation of many organic constituents that cannot be directly analyzed in wastewater residues).

Borosilicate Glass – A type of heat-resistant glass containing at least 5 percent boric oxide (by weight); used in glassware that resists heat and a leading candidate for use in high-level waste immobilization and disposal.

Capacity (of a facility) – The annual process throughput, in m³/yr under normal operating conditions. "Normal operating conditions" are the shift schedule under which the facility normally operates; i.e., one 8-hour shift/day, 5 days a week; two shifts/day, 5 days a week; 24 hours a day, 7 days a week. Facility operating capacity can be limited or regulated under a regulatory permit or interim status.

Carbon Adsorption (CARBN) – A treatment technology used to treat wastewaters containing dissolved organics at concentrations less than about 5 percent and, to a lesser extent, dissolved metal and other inorganic contaminants. The most effective metals removal is achieved with metal complexes. The two most common carbon adsorption processes are the granular activated carbon (GAC), which is used in packed beds, and the powdered activated carbon (PAC), which is added loosely to wastewater.

Cemented Solids (as a waste matrix) – Sludges or solids (e.g., particulates, etc.) that have been solidified/stabilized with cement or other solidifying agents but do not meet LDR treatment standards. These wastes may require pretreatment (e.g., crushing/grinding) prior to subsequent LDR treatment.

Characterization – The determination of waste contents and properties, whether by review of process knowledge, nondestructive evaluation/nondestructive analysis (NDE/NDA) or sampling and analysis.

Chemical Fixations – Any waste treatment process that involves reactions between the waste and certain chemicals, and results in solids that encapsulate, immobilize, or otherwise trap hazardous components in the waste to minimize the leaching of such components and to render the waste nonhazardous and more suitable for disposal.

Chemical Oxidation (CHOXD) – Chemical or electrolytic oxidation utilizing the following oxidation reagents (or waste reagents) or combinations of reagents: (1) hypochlorite (e.g., bleach); (2) chlorine; (3) chlorine dioxide; (4) ozone or UV (ultraviolet light) assisted ozone; (5) peroxides; (6) persulfates; (7) perchlorates; (8) permanganates; and/or (9) other oxidizing reagents of equivalent efficiency, performed in units operated such that a surrogate compound or indicator parameter is substantially reduced in concentration in the residuals (e.g., Total Organic Carbon can often be used as an indicator parameter for the oxidation of many organic constituents that cannot be directly analyzed in wastewater residues). Chemical oxidation specifically includes what is commonly referred to as alkaline chlorination.

Chemical Reduction (CHRED) – Chemical reduction utilizing the following reducing reagents (or waste reagents) or combination of reagents: (1) sulfur dioxide; (2) sodium, potassium, or alkali salts of sulfites, bisulfites, metabisulfates, and polyethylene glycols (e.g., Total Organic Halogens can often be used as an indicator parameter for the reduction of many halogenated organic constituents that cannot be directly analyzed in wastewater residues). Chemical reduction is commonly used for the reduction of hexavalent chromium to the trivalent state.

Cleanup – (1) Actions undertaken during a removal or remedial response to physically remove or treat a hazardous substance that poses a threat or potential threat to human health and welfare, the environment, and/or real and personal property. Sites are considered cleaned

up when removal or remedial programs have no further expectation or intention of returning to the site and threats have been mitigated or do not require action. (2) Actions taken to deal with a release or threat of release of a hazardous substance that could affect humans and/or the environment. The term "cleanup" is sometimes used interchangeably with either remedial action, removal action, response action, or corrective action.

Closure-Operational Closure – Actions taken upon completion of operations to prepare the disposal site or disposal unit for custodial care (e.g., addition of cover, grading, drainage, erosion control). **Final Site Closure**: Actions taken as part of a formal decommissioning or remedial action plan, the purpose of which is to achieve long-term stability of the disposal site and to eliminate to the extent practical the need for active maintenance so that only surveillance, monitoring, and minor custodial care are required.

Compliance Agreements – Legally binding agreements between regulators and regulated entities that set standards and schedules for compliance with environmental statutes, including Consent Order and Compliance Agreements, Federal Facility Agreements, and Federal Facility Compliance Agreements.

Concentration Based Standard – A restricted waste for which a concentration based standard has been developed for an extract of the waste or treatment residue, or the constituent concentration in the waste or treatment residue. These standards were based on best demonstrated available technology (BDAT) and the waste or waste extract or treatment residue must not exceed these concentrations if the waste is to be land disposed.

Contact-Handled Waste (CH) – Waste or waste containers whose external surface dose rate does not exceed 200 mrem per hour at the surface of the container.

Container – Any portable device in which a material is stored, transported, treated, disposed of, or otherwise handled.

Containment Building – A hazardous waste management unit used to store or treat hazardous waste under the provisions of Subpart DD of 40 CFR parts 264 and 265, which enumerates the design and operating standards for these units to ensure containment comparable to that of a RCRA tank or container.

Corrosive/Corrosivity – (1) A solid waste exhibits corrosivity if (a) a sample of the waste is either aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5; or (b) it is a liquid and corrodes steel at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55°C (130°F) (2) Identifies waste that must be segregated because of its ability to extract and solubilize toxic contaminants (especially heavy metals) from other waste.

Deactivation (DEACT) – The removal of the hazardous characteristics of a waste due to its ignitability, corrosivity, and/or reactivity.

Debris – Solid material exceeding a 60 mm particle size that is intended for disposal and that is 1) a manufactured object; or 2) plant or animal matter; or 3) natural geologic material. However, the following materials are not debris: 1) any material for which a specific treatment standard is provided in Subpart D, part 268; 2) process residuals such as smaller slag and residues from the treatment of waste, wastewater, sludges or air emission residues; and 3) intact containers of hazardous waste that are not ruptured and that retain at least 75% of their original volume. A mixture of debris that has not been treated to the standards provided by 40 CFR 268.45 and other material is subject to regulation as debris if the mixture is comprised primarily of debris by volume based on visual inspection.

Decommissioning – (1) Actions taken to reduce the potential health and safety impacts of DOE contaminated facilities, including activities to stabilize, reduce, or remove radioactive materials or to demolish the facilities. (2) Preparations taken for retirement of a nuclear

facility from active service, accompanied by the execution of a program to reduce or stabilize radioactive contamination. (3) The process of removing a facility or area from operation and decontaminating and/or disposing of it or placing it in a condition of standby with appropriate controls and safeguards.

Decontamination – The removal of unwanted material (typically radioactive material) from facilities, soils, or equipment by washing, chemical action, mechanical cleaning, or other techniques.

Defense Waste – (1) Radioactive waste from any activity performed in whole or in part in support of DOE atomic energy defense activities; excludes waste under purview of the Nuclear Regulatory Commission or generated by the commercial nuclear power industry. (2) Nuclear waste derived mostly from the manufacture of nuclear weapons, weapons related research programs, the operations of naval reactors, and the decontamination of production facilities.

Delist – Use of the petition process to have a waste stream's RCRA toxic designation rescinded.

Delisting – According to 40 CFR 260.20 and .22, in order to be exempted from the RCRA hazardous waste "system," a listed hazardous waste, a mixture of a listed and solid waste, or a derived-from waste must be delisted. Characteristic hazardous wastes never need to be delisted, but can be treated to eliminate the characteristic. A contained-in waste also does not have to be delisted; it only has to "no longer contain" the hazardous waste.

Department of Energy Waste – Radioactive waste generated by activities of the DOE (or its predecessors), waste for which DOE is responsible under law or contract, or other waste for which the DOE is responsible.

Derived-From Rule – This rule states that any solid waste derived from the treatment, storage, or disposal of a listed RCRA hazardous waste is itself a listed hazardous waste (regardless of the concentration of hazardous constituents) unless delisted per RCRA 40 CFR §260.22. For example, ash and scrubber water from the incineration of a listed waste are hazardous wastes on the basis of the derived-from rule. Solid wastes derived from a characteristic hazardous waste are hazardous wastes only if they exhibit a characteristic.

Disposal – The permanent isolation of waste with no intent of recovery.

Disposal Facility – (1) The land, structures, and equipment used for the disposal of waste. (2) A facility or part of a facility at which waste is intentionally placed into or on the land or water, and at which waste will remain after closure.

Effluent – (1) Airborne and liquid wastes discharged from a DOE site or facility following such engineering waste treatment and all effluent controls, including onsite retention and decay, as may be provided. This term does not include solid wastes, wastes for shipment offsite, wastes that are contained (e.g., underground nuclear test debris) or stored (e.g., in tanks) or wastes that are to remain onsite through treatment or disposal. (2) Wastewater (treated or untreated) that flows out of a treatment plant, sewer, or industrial outfall. Effluent may refer to wastes discharged into surface waters.

Elemental Lead (Activated and Non-Activated) (as a waste matrix) – Both surface contaminated and activated elemental lead. Activated lead includes lead from accelerators or other neutron sources that may result in irradiation. Surface contaminated lead materials include bricks, counterweights, shipping casks, and other shielding materials.

Environmental Impact Statement (EIS) – (1) A document prepared in accordance with the requirements of §102(2)(C) of NEPA. (2) A tool for decision making; it describes the positive and negative effects of the undertaking and lists alternative actions. The draft document

(DEIS) is prepared by the EPA, or under EPA guidance, and attempts to identify and analyze the environmental impacts of a proposed action and feasible alternatives, and is circulated for public comment prior to preparation of the final environmental impact statement.

Environmental Restoration (ER) – Measures taken to clean up and stabilize or restore a site to regulatory acceptable conditions when the site has been contaminated with hazardous substances during past production or disposal activities.

Environmental Restoration Waste – Waste generated by environmental restoration program activities.

Existing Facility – (1) Any equipment, structure, system, process or activity that fulfills a specific purpose. Examples include accelerators, storage areas, fusion research devices, nuclear reactors, production or processing plants, coal conversion plants, magnetohydrodynamics experiments, windmills, radioactive waste disposal systems and burial grounds, testing laboratories, research laboratories, transportation activities, and accommodations for analytical examinations of irradiated and unirradiated components. (2) Buildings and other structures; their functional systems and equipment, including site development features such as landscaping, roads, walks and parking areas; outside lighting and communications systems; central utility plants; utilities supply and distribution systems; and other physical plant features. (3)(a) Any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, or aircraft, or (b) any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer produce in consumer use or any vessel. For purposes of this document, where related to treatment facilities, existing means operating, under construction, or with environmental permit applications submitted.

Facility – All contiguous land, buildings, and other structures; their functional systems and equipment, including site development features such as landscaping, roads, walks and parking areas; outside lighting and communications systems; central utility plants; utilities supply and distribution systems; and other physical plant features.

Federal Facility Compliance Agreement (FFCA) – An agreement between the DOE, a host state and/or EPA with respect to how and/or when some waste-related activity will be conducted to achieve compliance with applicable regulations in a timely manner. This agreement is a major driver or constraint on activities that site must undertake for waste operations.

Filtration – Removal/separation of particles from a mixture of fluid and particles by a medium that permits the flow of the fluid but retains the particles. Usually, the larger the particles, the easier they are to remove from the fluid.

Free Liquid – Liquid not absorbed into host material such that it could readily separate from the solid portion of a waste under ambient temperature and pressure, and spill and drain from its container.

Fuel Substitution (FSUBS) – Fuel substitution in units operated in accordance with applicable technical operating requirements.

Generation – Wastes resulting from new production, rework operations, wastes generated from D&D operations, and wastes resulting from environmental restoration operations, including the recovery of pre-1970 wastes, should their recovery be determined to be necessary.

Generator – Current or previously operated facilities of the DOE that have produced or are producing waste.

Glovebox – (1) A sealed volume penetrated by leaded-rubber gloves that allows safe manipulation of some alpha-emitting particles. (2) A windowed, low-leaking enclosure equipped with one or more pairs of flexible gloves to allow outside personnel to handle radioactive material within the enclosure.

Groundwater – Liquid water occurring beneath the earth's surface in the interstices between soil grains, in fractures, or in porous formations.

Groundwater Contamination – The pollution of the underground sources of springs and wells. Contamination can result from indiscriminate land disposal of potentially hazardous waste materials that are then dissolved or suspended in free liquids, usually water, and leach downward through the unsaturated profile to the zone of saturation or from improperly constructed or operated wells. Movement of the toxic materials in the saturated zone is horizontal, and the rate of flow is determined by the gradient of the aquifer and its permeability. Correction of the problem is seldom limited to one site.

Groundwater Remediation – Treatment of groundwater to remove pollutants.

Hazardous Debris – Debris that contains a hazardous waste listed in Subpart D of Part 261, or that exhibits a characteristic of hazardous waste identified in Subpart C of Part 261 (40 CFR 268.2(h)).

Hazardous Waste (HW) – (1) Those wastes that are designated hazardous by EPA [or state] Regulations. (2) Byproducts of production or operation that can pose a potential hazard to human health or the environment when improperly managed and that possess at least one of four characteristics (ignitability, corrosivity, reactivity, toxicity), or that appear on special EPA or state lists. (3) A solid waste or combination of solid waste, that, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may (a) cause, or significantly contribute to, an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. (4) Those wastes listed by EPA or meeting characteristics specified by EPA in their criteria pursuant to the RCRA. Disposal, treatment, or storage of hazardous waste can only take place in a site or facility issued a permit, interim status or receiving a regulatory exemption by EPA or a state, or as allowed for accumulation and treatment in RCRA 40 CFR 262.34. Note: Source material, special nuclear material, and byproduct material, as defined by the AEA of 1954 as amended, are excluded.

Heterogeneous Debris (as a waste matrix) – Wastes with matrices meeting the definition of debris per the 8/18/92 LDR debris rulemaking (57 FR 37194, 8/18/92). This category includes debris that do not meet the criteria for categorization as either Organic Debris or Inorganic Debris. This category also includes mixtures of debris and solid process residues or soil, provided debris comprises more than 50 percent of the waste.

High-Level Radioactive Waste (HLW) – (1) The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid that contains a combination of TRU waste and fission products in concentrations requiring permanent isolation. (2)(a) Irradiated reactor fuel, (b) liquid wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuel, and (c) solids into which such liquid wastes have been converted. (3) As defined by the NWPA, (a) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including the liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that

contains fission products in sufficient concentrations; and (b) other highly radioactive material that the NRC, consistent with existing law, determines by rule to require permanent isolation. (4) Waste generated in the fuel of a nuclear reactor, or waste found at nuclear reactors or nuclear fuel reprocessing plants. These wastes are a serious threat to anyone who comes near them without shielding.

High-Level Vitrification (HLVIT) – Vitrification of high-level mixed radioactive wastes in units which comply with all applicable radioactive protection requirements under control of the Nuclear Regulatory Commission.

Ignitability/Ignitable – A waste property describing RCRA characteristically hazardous waste with a flash point lower than 140°F.

Immobilization – Treatment of waste through macroencapsulation, microencapsulation, or sealing to reduce surface exposure to potential leaching media, or to reduce the leachability of the hazardous constituents.

Immobilized Materials – Materials fixed in a matrix.

Incineration (INCIN) – (1) The controlled process by which combustible solid, liquid, or gaseous wastes are burned and changed into noncombustible gases and solid ash. (2) A treatment technology using combustion to destroy organic constituents and reduce the volume of wastes.

Incineration of Wastes Containing Organics and Mercury (IMERC) – Incineration of wastes containing organics and mercury in units operated in accordance with the technical operating requirements of 40 CFR part 264 subpart O and part 265 subpart O. All wastewater and nonwastewater residues derived from this process must then comply with the corresponding treatment standards per waste code with consideration of any applicable subcategories (e.g., High or Low Mercury Subcategories).

Inorganic Debris (as waste matrix) – Wastes with matrices meeting the definition of debris per the 8/18/92 LDR debris rulemaking (57 FR 37194, 8/18/92). More specifically, this category is defined for wastes that contain >90 percent inorganic debris. Examples include the following: metal shapes (e.g., equipment, scrap), metal turnings, glass (e.g., light tubes, leaded glass, etc.), ceramic materials, concrete, rocks. To meet the debris definition, material must be incapable of passing through a 9.5 mm standard sieve.

Inorganic Sludges/Particulates (as a waste matrix) – Solid process residues with a predominately inorganic matrix. Solid process residues do not fit the definition of debris. Typically, these solids are sludge or particulate materials. Waste in this category may also contain some debris materials, provided the amount of debris is less than 50 percent (based on LDR debris rule). The solids in this category may be contaminated with or contain organics, such that thermal treatment is required. However, the matrices are predominantly inorganic so that thermal treatment would result in a high residue. Examples in this category are the following: sludges, ashes, and blasting media, absorbed aqueous or organic liquids (or inorganic particulate absorbents), ion exchange resins, and paint chips/residues.

Ion Exchange – A process that separates a mixed waste into its radioactive and hazardous constituents if the radioactive components are ionic. It will also concentrate the radioactive ionic species into a small volume, leaving a nonradioactive aqueous phase. The principal mixed waste application of this process is to recover metallic radionuclides from wastewaters or acid leach liquors.

Job Control Waste (JCW) – Discarded materials such as laboratory coats, plastic shoe covers, protective gloves and other paper, cloth, plastic and glass products used in operations and preventive maintenance activities.

Lab Packs with Metals and Lab Packs without Metals (as waste matrices) – Wastes with one or more small containers of free liquids or solids surrounded by solid materials (virgin or waste materials) within a larger container. These categories include scintillation fluids that are packaged with vials. The difference between wastes in these categories is contaminants. Lab packed wastes contaminated with TC metals are "Lab packs with Metals." Lab packed wastes not contaminated with TC metals are categorized as "Lab packs without Metals."

Land Disposal – Placement in or on the land including, but not limited to, placement in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome, salt bed formation, underground mine or cave, or placement in a concrete vault or bunker intended for disposal purposes.

Land Disposal Restrictions (LDR) – (1) Provisions of the HSWA requiring phased-in treatment of hazardous wastes before disposal. (2) A RCRA program that restricts land disposal of RCRA hazardous wastes and requires treatment to promulgated treatment standards. (See Thirds Rule)

Leachate – (1) Any liquid, including any suspended components in the liquid, that has percolated through or drained from hazardous waste. (2) A contaminated liquid resulting when water percolates, or trickles, through waste materials and collects waste components. Leaching may occur at landfills and may result in hazardous substances entering soil, surface water, or groundwater.

Listed Waste – Wastes listed as hazardous under RCRA 40 CFR 261 Subpart D which includes lists of nonspecific source wastes, specific source wastes and commercial chemical products or manufacturing chemical intermediates. These materials are listed because they exhibit a characteristic of hazardous waste, meet the statutory definition of hazardous waste, or are acutely toxic, acutely hazardous, or otherwise toxic.

Liquid Mercury (as a waste matrix) – Any wastes containing bulk volumes of elemental liquid mercury. The category includes lab packs of strictly liquid mercury or other containers containing bulk mercury.

Low-Level Radioactive Waste (LLW) – (1) Waste that contains radioactivity and is not classified as high-level waste, TRU waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of TRU is less than 100 nCi/g. (2) Radioactive waste not classified as high-level waste, TRU waste, spent nuclear fuel, or byproduct material.

Macroencapsulation (MACRO) (technology based standard) – Application of surface coating materials such as polymeric organics (e.g., resins and plastics) or a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media. Macroencapsulation specifically does not include any material that would be classified as a tank or container according to 40 CFR 260.10.

Macroencapsulation (MACRO) (alternative standard for debris) – Identical definition to the one immediately above for the technology based standard except this definition excludes the last sentence referring to use of materials that could be classified as a tank or container.

Metals Recovery (RMETL) – Recovery of metals or inorganics utilizing one or more of the following direct physical/removal technologies: (1) ion exchange; (2) resin or solid (i.e., zeolites) adsorption; (3) reverse osmosis; (4) chelation/solvent extraction; (5) freeze crystallization; (6) ultrafiltration and/or (7) simple precipitation (i.e., crystallization). Note:

This does not preclude the use of other physical phase separation or concentration techniques such as decantation, filtration, (including ultrafiltration) and centrifugation, when used in conjunction with the above listed recovery technologies.

Microencapsulation – Stabilization of the debris with the following reagents (or waste reagents) such that the leachability of the hazardous contaminants is reduced: (1) Portland cement; or (2) Lime/pozzolans (e.g., fly ash and cement kiln dust). Reagents (e.g., iron salts, silicates, and clay) may be added to enhance the set/cure time and/or compressive strength, or to reduce the leachability of the hazardous constituents.

Mixed Low-Level Waste (MLLW) – Low-level waste that also includes hazardous materials as identified in 40 CFR 261, Subparts C and D.

Mixed TRU (MTRU) Waste – TRU waste that also includes hazardous materials as identified in 40 CFR 261, Subparts C and D.

Mixed Waste – Waste that contains both hazardous waste and source, special nuclear, or by-product material subject to the Atomic Energy Act of 1954 (42 USC 2011 et seq.) (from Sec 1004 of the Solid Waste Disposal Act – 42 USC 6902).

Mixture Rule – Under the mixture rule, when any solid waste and a listed hazardous waste are mixed, the entire mixture is a listed hazardous waste unless the listed waste is listed for exhibiting a characteristic of a hazardous waste. Mixtures of solid waste and listed hazardous waste that are listed solely for exhibiting a characteristic are not hazardous if the resulting mixture no longer exhibits any characteristic. Mixtures of solid wastes and characteristic hazardous wastes are hazardous only if the mixture exhibits a characteristic. (40 CFR 261.3(a)(2))

Moratorium Waste – Hazardous or Toxic Substances Control Act (TSCA) regulated waste generated inside of a Radioactive Materials Management Area (RMMA) believed with a high-level of confidence to be free of radioactive contamination but subject to DOE-HQ shipping moratorium. The moratorium will be lifted once the appropriate SRS radiological screening procedures have been approved by DOE-HQ.

Neutralization (NEUTR) – Use of the following reagents (or waste reagents) or combinations of reagents: (1) Acids; (2) bases; or (3) water (including wastewaters) resulting in a pH greater than 2 but less than 12.5 as measured in the aqueous residuals.

Nondefense Related Waste – Radioactive waste under the purview of the Nuclear Regulatory Commission or generated by the commercial nuclear power industry, and not derived from the manufacture of nuclear weapons, weapons related research programs, operations of naval reactors and the decontamination of production facilities.

Nonwastewater – Waste that does not meet the criteria for wastewater found later in these definitions.

Onsite – (1) Within a single research or production site of the DOE weapons complex; e.g., Los Alamos National Laboratory (LANL) is a site, as is SRS, etc. (2) The contaminated area and all potential areas in very close proximity to the contamination that must be taken into account for effective implementation of the response action.

Onsite Facility – A hazardous waste treatment, storage, or disposal area that is located on the generating site.

Organic Debris (as a waste matrix) – Wastes with matrices meeting the definition of debris per the 8/18/92 LDR debris rulemaking (57 FR 37194, 8/18/92). This category is defined for wastes that contain >90 percent organic debris. Examples include: rags (including "solvent

bags") plastic/rubber, paper, wood, glovebox gloves (including lead-lined), and animal carcasses.

Organic Liquids (as a waste matrix) – Liquids/slurries with a total organic carbon (TOC) content greater than or equal to 1 percent. Slurries must be pumpable (e.g., suspended/settled solids can be up to approximately 35-40 percent). Only liquids/slurries packaged/stored in bulk form (i.e., tank stored, drummed bulk free liquids) are included in this category. Liquids packaged in lab pack-type configuration are categorized as lab packs.

Organic Sludges/Particulates (as a waste matrix) – Solid process residues with an organic matrix. Solid process residues are solids that do not fit the definition of debris. Typically, these solids are sludge or particulate materials. Waste in this category may also contain some debris materials, provided the amount of debris is less than 50 percent (based on LDR debris rule). As opposed to Inorganic Sludges/Particulates, wastes in this category would not leave a large residue when thermally treated. Example waste materials are: organic sludges, (e.g., sewage sludges) activated carbon, organic resins, and absorbed liquids (organic particulate absorbents).

Package – A barrel, box, or other container into which waste is initially placed. A package is placed in packaging prior to transportation.

pH – (1) Used to describe the hydrogen-ion activity of a system. The logarithm of the reciprocal of hydrogen ion concentration ($-\log_{10} [H^+]$, where $[H^+]$ is hydrogen-ion concentration in moles per liter). (2) a symbol for the degree of acidity or alkalinity.

Plutonium-Uranium Extraction (PUREX) process – A solvent extraction process used in the reprocessing of uranium/plutonium-based nuclear fuels.

Precipitation (PRECP) – Treatment of metals and other inorganics to form insoluble precipitates of oxides, hydrides, carbonates, sulfides, sulfates, chlorides, fluorides, or phosphates. The following reagents (or waste reagents) are typically used alone or in combination: (1) Lime (i.e., containing oxides and/or hydroxides of calcium and/or magnesium); (2) caustic (i.e., sodium and/or potassium hydroxides); (3) soda ash (i.e., sodium carbonate); (4) sodium sulfide; (5) ferric sulfate or ferric chloride; (6) alum; or (7) sodium sulfate. Additional flocculating, coagulating or similar reagents/processes that enhance sludge dewatering characteristics are not precluded from use.

Pretreatment Processes – Processes (e.g., shredding, grinding, physical separation, etc.) that make the waste amenable to the treatment process that ultimately destroys, removes, or immobilizes the hazardous contaminants or characteristics.

Radiation – (1) Ionizing radiation that includes any or all of the following: gamma rays and x-rays, alpha and beta particles, high-speed electrons, neutrons, high-speed protons, and other atomic particles. This definition does not include nonionizing radiations, such as sound, microwave, radiowave or visible, infrared, or ultraviolet light. (2) Refers to the process of emitting energy in the form of rays or particles that are thrown off by disintegrating atoms. The rays or particles emitted may consist of alpha, beta, or gamma radiation.

Radioactive Materials Management Area (RMMA) – An area in which the potential exists for contamination due to the presence of unencapsulated or unconfined radioactive material or an area that is exposed to beams or other sources of particles (neutron, protons, etc.) capable of causing activation. Any of the following areas constitute an RMMA:

- 1) radiological buffer areas (except those established for a radiation field only) and all areas they encompass.
- 2) Radioactive Management Areas.
- 3) Soil contamination areas and the surrounding area that is greater than twice the background level of radiation.
- 4) Underground radioactive material areas that have undergone operations to expose radionuclides (e.g., excavation).
- 5) the area inside the OSHA physical control (e.g., fence)

that was established for an environmental restoration activity where radioactive material is present.

Radioactive Mixed Waste – (See Mixed Waste)

Radioactive Waste – (1) Solid, liquid, or gaseous material that contains radionuclides regulated under the AEA of 1964, as amended, and of negligible economic value considering recovery costs. (2) A solid, liquid, or gaseous material of negligible economic value that contains radionuclides in excess of threshold quantities. Radioactive waste does not include material contaminated by radionuclides from nuclear weapons testing.

Radioactivity – (1) The spontaneous nuclear decay of material with a corresponding release of energy in the form of particles and/or electromagnetic radiation. (2) The property or characteristic of radioactive material to spontaneously "disintegrate" with the emission of energy in the form of radiation. The unit of radioactivity is the curie.

Radionuclide – (1) A species of atom having an unstable nucleus that is subject to spontaneous decay. (2) Any nuclide that emits radiation. A nuclide is a species of atom characterized by the constitution of its nucleus and hence by its number of protons, neutrons, and energy content.

Reactive Metals (as a waste matrix) – Bulk reactive metals and equipment contaminated with reactive metals. Bulk reactive metals include sodium, alkali metal alloys, aluminum fines, uranium fines, zirconium fines, and other pyrophoric materials. Contaminated equipment includes piping, pumps, and other materials with a residue or reactive metals that cannot be separated from the equipment medium.

Reactivity – A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has any of the following properties: (1) It is normally unstable and readily undergoes violent change without detonating. (2) It reacts violently with water. (3) It forms potentially explosive mixtures with water. (4) When mixed with water, it generates toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health and the environment. (5) It is a cyanide or sulfide bearing waste which when exposed to pH conditions between 2 and 12.5, can generate toxic gases vapors or fumes in a quantity sufficient to present a danger to human health or the environment. (6) It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement. (7) It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure. (8) It is a forbidden explosive as defined in 49 CFR 173.51, or a Class A explosive as defined in 49 CFR 173.53 or a Class B explosive as defined in 49 CFR 173.88.

Recovery of Organics (RORGs) – Recovery of organics utilizing one or more of the following technologies: (1) distillation; (2) thin film evaporation; (3) steam stripping; (4) carbon adsorption; (5) critical fluid extraction; (6) liquid-liquid extraction; (7) precipitation/crystallization (including freeze crystallization); or (8) chemical phase separation techniques (i.e., addition of acids, bases, demulsifiers, or similar chemicals); Note: this does not preclude the use of other physical phase separation techniques such as a decantation, filtration (including ultrafiltration), and centrifugation, when used in conjunction with the above listed recovery technologies.

Remedial Action (RA) – (1) Activities conducted at DOE facilities to reduce potential risks to people and/or harm to the environment from radioactive and/or hazardous substance contamination. (2) Those actions consistent with permanent remedy taken instead of, or in addition to, removal action in the event of a release or threatened release of a hazardous substance into the environment to prevent or minimize the release of hazardous substances so that they do not migrate to cause substantial danger to present or future public health or welfare or the environment. The term includes, but is not limited to, such actions at the

location of the release as storage, confinement, perimeter protection, clay cover, neutralization, cleanup of released hazardous substances or contaminated materials, recycling or reuse, diversion, destruction, segregation of reactive wastes, dredging or excavations, repair or replacement of leaking containers, collection of leachate and runoff, onsite treatment or incineration, provision of alternative water supplies, and any monitoring reasonably required to ensure that such actions protect the public health and welfare and the environment. The term includes the costs of permanent relocation of residents and businesses and community facilities where the President determines that, alone or in combination with other measures, such relocation is more cost-effective than, and environmentally preferable to, the transportation, storage, treatment, destruction, or secured disposition offsite of such hazardous substances, or may otherwise be necessary to protect the public health or welfare. The term does not include offsite transport of hazardous substances or contaminated materials unless the President determines that such actions; are more cost-effective than other remedial actions; will create new capacity to manage in compliance with Subtitle C of the SWDA, hazardous substances in addition to those located at the affected facility; or are necessary to protect public health or welfare or the environment from a present or potential risk that may be created by further exposure to the continued presence of such substances or materials [as defined by §101(24) of CERCLA].

Remote-Handled Waste (RH) – (1) Packaged waste with an external surface dose rate that exceeds 200 mrem per hour.

Remote Handling – The handling of wastes from a distance so as to protect human operators from unnecessary exposure.

Residues – Plutonium bearing sludges that are not yet defined either as waste or as a resource for reprocessing.

Resource Conservation and Recovery Act (RCRA) Part A Permit Application – The first part of a Resource Conservation and Recovery Act permit application that identifies treatment, storage, and disposal units within a facility for which a permit is requested.

Resource Conservation and Recovery Act (RCRA) Part B Permit Application – The detailed second part of a RCRA permit application that describes waste to be managed, and waste quantities, and facilities.

Retorting or Roasting (RMERC) – Retorting or roasting in a thermal processing unit capable of volatilizing mercury and subsequently condensing the volatilized mercury for recovery. The retorting or roasting unit (or facility) must be subject to one or more of the following: (a) A National Emissions Standard for Hazardous Air Pollutants (NESHAP) for mercury; (b) a Best Available Control Technology (BACT) or a Lowest Achievable Emission Rate (LAER) standard for mercury imposed pursuant to a Prevention of Significant Deterioration (PSD) limit; or (c) a state permit that establishes emission limitations (within meaning of section 302 of the Clean Air Act) for mercury. All wastewater and nonwastewater residues derived from this process must then comply with the corresponding treatment standards per waste code with consideration of any applicable subcategories (e.g., High or Low Mercury Subcategories).

Segregation – The separation of waste materials to facilitate handling, storage, treatment, transportation, and/or disposal.

Site – (1) A geographic entity comprising land, buildings, and other facilities required to perform program objectives. Generally a site has, organizationally, all of the required facilities for management functions. That is, it is not a satellite of some other site. (2) For the purposes of the ERWM Five-Year Plan, sites are lands, installations, and/or facilities for which DOE has or shares responsibility for ERWM activities. (3) An area or a location at which hazardous substances have been stored, treated, disposed of, placed, or located. This

includes all contiguous land, structures, other appurtenances, and improvements on the land used for treatment, storage, or disposal of hazardous substances. A site may consist of several treatment, storage, or disposal facilities (e.g., impoundments, containers, building, or equipment).

Site Characterization – The program of exploration and research, both in the laboratory and in the field, undertaken to establish the geologic conditions and the ranges of those parameters of a particular site relevant to the procedures under this part. Site characterization includes borings, surface excavations, excavation of exploratory shafts, limited subsurface lateral excavations and borings and geophysical testing.

Site Closure and Stabilization – Those actions that are taken upon completion of operations that prepare the disposal site for custodial care and ensure that the disposal site will remain stable and will not need ongoing active maintenance.

Sludge – Any solid, semi-solid, or liquid waste generated from a wastewater treatment plant, water supply treatment plant, or air pollution control facility exclusive of treated effluent from a wastewater treatment plant.

Soil (as a waste matrix) – Soils contaminated with hazardous constituents and radioactivity that are stored in waste containers. Includes soils contaminated with organics, inorganics, or both.

Soil With <50 Percent Debris (as a waste matrix) – Soils contaminated with hazardous constituents and radioactivity that are stored in waste containers, including soils contaminated with organics, inorganics, or both. This category may include debris, provided it is less than 50 percent of the waste.

Stabilization (STABL) – A broad class of treatment processes that immobilize hazardous constituents in a waste. For treatment of metals in mixed low-level wastes and for TRU wastes containing low-level radioactive components, stabilization technologies will reduce the leachability of the hazardous metal constituents (regardless of whether the metals are radioactive) in nonwastewater matrices.

Steam Stripping – A continuous process conducted in a unit that consists of a boiler, a stripping column, a condenser, and a collection tank. Steam stripping of organics from liquid wastes utilizes direct application of steam to the wastes operated such that liquid and vapor flow rates, as well as, temperature and pressure ranges, have been optimized, monitored, and maintained. These operating parameters are dependent upon the design parameters of the unit such as the number of separation stages and the internal column design. Thus resulting in a condensed extract high in organics that must undergo incineration, reuse as a fuel, or other recovery/reuse and an extracted wastewater that must undergo further treatment as specified in the standard.

Storage – (1) Temporary holding of waste pending treatment or disposal. Storage methods include containers, tanks, waste piles, surface impoundments, and containment buildings. (2) The containment of hazardous waste, either on a temporary basis or for a period of years, in such a manner as not to constitute disposal of such hazardous waste. (3) Retrievable retention of waste pending disposal.

Supercompaction – A volume-reduction method relying on mechanical compaction.

Technology Based Standard – A restricted waste for which a technology based standard is specified may be land disposed after it is treated using that specified technology or an equivalent treatment method approved by the Administrator of EPA.

Thermal Recovery of Lead (RLEAD) – Thermal recovery of lead in secondary lead smelters.

Thermal Treatment – The treatment of hazardous waste in a device that uses elevated temperatures as the primary means to change the chemical, physical, or biological character or composition of the hazardous waste. Examples of thermal treatment processes are incineration, pyrolysis, calcination, wet air oxidation, and microwave discharge.

Toxicity Characteristic Leaching Procedure (TCLP) – A test designed to determine the mobility of both organic and inorganic analytes present in liquid, solid, or multi-phase wastes. If a solid waste analyzed using this method or approved equivalent demonstrates contaminant levels in excess of the listed concentrations found in the RCRA regulations, the waste is hazardous for the characteristic of toxicity.

Transuranic Waste (TRU) – This core definition appears in modified form in various relevant documents: Waste containing alpha-emitting radionuclides with an atomic number greater than 92 and half-lives greater than 20 years, at concentrations greater than 100 nCi/g of waste. Modifications include the following: (1) For purposes of management, DOE Order 5820.2A (a) considers TRU waste, as defined above, "without regard to source or form" [The proposed revision to the Order ("DOE Order 5820.2A Major Issues for Revision," May 6, 1992) contemplates removing this clause.]; (b) allows heads of field elements to determine that wastes containing other alpha-emitting radionuclides must be managed as TRU waste; and (c) adds "at time of assay," implying both that the classification of a waste as TRU is to be made based on an assay and that such classification can be superseded only by another assay. (2) For purposes of setting standards for management and disposal, 40 CFR 191.02(i) adds "except for: (a) high-level radioactive wastes; (b) wastes that the DOE has determined, with the concurrence of the Administrator [of EPA] do not need the degree of isolation required by this part; or (c) wastes that the Commission [NRC] has approved for disposal on a case-by-case basis in accordance with 10 CFR 61 [Licensing Requirements for Land Disposal of Radioactive Wastes]."

Treatability Group – Based on the radioactive characteristics, hazardous components, and physical/chemical matrices as discussed above, DOE has grouped its wastes to reflect salient treatment considerations for each waste stream. These "treatability groups" are used to relate waste streams and waste quantities to treatment facilities and technology development needs.

Treatment – (1) Any method, technique, or process designed to change the physical or chemical character of waste to render it less hazardous, safer to transport, store or dispose of, or reduced in volume. (2) Any activity that alters the chemical or physical nature of a hazardous waste to reduce its toxicity, volume, mobility, or render it amenable for transport, storage, or disposal.

Treatment Facility – The specific area of land, structures, and equipment dedicated to waste treatment and related activities.

Treatment, Storage, and Disposal (TSD) Facility – Any building, structure, or installation where a radioactive or hazardous substance has been treated, stored, or disposed.

Treatment System – The equipment and processes used for similar waste types at treatment facilities. A treatment system is the unit treatment operation or sequence of unit treatment operations carried out on all wastes that enter the system (e.g., a treatment system may consist of chemical reduction followed by precipitation, or an incinerator and a vitrification unit for the ash).

Unit – Discrete part of a facility used to treat, store, or dispose of hazardous or mixed waste.

Variance – Any mechanism or provision which allows modification to or waiver of the generally applicable requirement.

Vitrification – (1) A waste treatment process in which calcined or another decomposed form of waste is mixed with glass and fused into a solid mass. The resultant mass is expected to remain a stable and insoluble form for long time periods, and thus will be a leading candidate for the most benign waste form for disposal. (Vitrification with borosilicate glass is the BDAT for HLW and certain mixed waste streams.) (2) The conversion of high-level waste materials into a glassy or noncrystalline solid for subsequent disposal. (3) The process of immobilizing waste that produces a glass-like solid that permanently captures the radioactive materials.

Volatile Organic Compound (VOC) – (1) Any reactive organic compound as defined in 40 CFR 60.2 definitions. (2) An organic compound that evaporates (volatilizes) readily at room temperature.

Waste Acceptance Criteria (WAC) – The criteria used to determine if waste and waste packages are acceptable for treatment, storage, transportation and disposal purposes.

Waste Characterization – Activities to determine the extent and nature of the waste. Note: Waste characterization may be based on process knowledge nonintrusive nondestructive examination/nondestructive assay (NDE/NDA), or intrusive examination such as sampling and analysis.

Waste Form – The physical form of the waste such as sludges, combustibles, metals, etc.

Waste Isolation Pilot Plant (WIPP) – (1) The project authorized under §213 of the DOE National Security and Military Applications of Nuclear Energy Authorization Act of 1980 (Public Law 96-164; 93 Stat. 1259, 1265) to demonstrate the safe disposal of radioactive waste materials generated by atomic energy defense activities. (2) A research and development facility, located near Carlsbad, New Mexico, to be used for demonstrating the safe disposal of TRU wastes from DOE activities.

Waste Management – The planning, coordination, and direction of those functions related to generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated surveillance and maintenance activities.

Waste Minimization – (1) An action that effectively avoids or reduces the generation of waste by source reduction, improving energy usage, or by recycling. This action is consistent with the general goal of minimizing present and future threats to human health, safety, and the environment. (2) The reduction, to the extent feasible, of hazardous waste that is generated prior to treatment, storage, or disposal of the waste. Waste minimization includes any source reduction or recycling activity that results in either (a) reduction of total volume of hazardous waste, (b) reduction of toxicity of hazardous waste or (c) both.

Waste Segregation – The separation of waste materials before the package (or repackaging) process to facilitate handling, storage, treatment, transportation, and/or disposal.

Waste Stream – A flow of waste materials with specific definable characteristics that remain the same throughout the life of the process generating the waste stream. A waste stream is produced by a single process or sub-process; however, that process or sub-process may be one that combines two or more input waste streams together to produce a single output waste stream.

Wastewaters – Wastes that contain less than 1 percent by weight total organic carbon (TOC) and less than 1 percent by weight total suspended solids (TSS) with the following exception: F001, F002, F003, F004, F005, wastewaters are solvent-water mixtures that contain less than 1 percent by weight TOC or less than 1 percent by weight total F001, F002, F003, F004, F005 solvent constituents listed in 40 CFR 286.41, Table CCWE (Constituent Concentrations in Waste Extract).

Section 2.2 Preferred Option Selection Process

DOE-HQ prepared several guidance documents to assist the sites in working through treatment identification and selection of preferred options. Guidance is found in these documents:

- U. S. Department of Energy, "Annotated Outline for the Draft Site Treatment Plans", Rev. 3 – draft, March 28, 1994.
- U. S. Department of Energy, "DPSTP Development Framework Implementation Guidance," Revision 0, February 15, 1994.
- U. S. Department of Energy, "Draft Site Treatment Plan Cost Guidance," Revision 1, April 28, 1994.
- U. S. Department of Energy, "Draft Site Treatment Plan Development Framework," Revision 7, April 7, 1994.
- U. S. Department of Energy, "Guidance for Draft Site Treatment Plan (DSTP) Development," Rev. 4, May 10, 1994.
- U. S. Department of Energy, "Guidance for Preparation of DSTP, Appendix A," Revision 1, April 7, 1994.
- U. S. Department of Energy, "Protocol for Identifying a Potential Offsite Mixed Waste Treatment Option in the DSTP," Revision 1, March 7, 1994.
- U. S. Department of Energy, "Treatment Selection Guides," Revision 0, March 14, 1994.

The Treatment Selection Guides provide information on selecting among treatment options by comparing the options on fundamental criteria such as regulatory compliance, environmental health and safety, treatment effectiveness, implementability, stakeholder concerns, life cycle costs, and technology development. The DSTP Cost Information Guidance provides a level of consistency in the cost information by providing common cost assumptions. Drafts of these and other technical assistance documents were provided to the states and their comments incorporated into the final revision. These documents are available for review.

SRS technical personnel developed a method for selecting one preferred treatment process for each waste from a wide variety of treatment options. The SRS approach to treatment option analysis combined methods stipulated in the guidance provided by DOE (see above) with technology assessment techniques developed by WSRC. The detailed description of the treatment process selection process appears in Sections 2.2.1 and 2.2.2.

Options Evaluation Process

This section contains two subsections. Subsection 2.2.1 contains an overview of the three step process used to identify preferred options (POs). Subsection 2.2.2 contains detailed descriptions of each process step.

2.2.1 Process Methodology Overview

This section describes step by step the evaluation process used to determine preferred options (POs) for waste treatment.

Step 1 Identify Feasible Options

Purpose

To identify existing treatment facilities, existing production facilities with waste treatment capabilities and planned treatment facilities that are technically feasible options for treating the SRS mixed waste streams.

It was assumed that facility modifications, permit modifications, etc., would be achievable.

Performed by

Technical personnel from each treatment and processing facility, along with the engineers and scientists assigned to the technical group who developed the DSTP.

Step 2 Perform Initial Screening

Purpose

To reduce the number of feasible options by assessing the technology success of the option.

The technology success assessment addresses the maturity and complexity of a feasible option to determine "viable" treatment options.

By assigning a Technology Success Factor (TSF) score to each feasible option, the feasible options are ranked. Those feasible options that received a high score become viable options requiring further analysis. Those feasible options that received a low score were rejected.

Performed by

Technical personnel from each treatment and processing facility, along with the engineers and scientists assigned to the technical group (IDOA), who developed the DSTP.

Step 3 Perform In-depth Options Analysis

Purpose

To identify a PO for each waste stream.

Performed by

Technical personnel from each treatment and processing facility, along with the engineers and scientists assigned to the technical group who developed the DSTP.

2.2.2 Process Methodology Detailed Explanation

The SRS MWIR, also a requirement of the FFCAct, currently lists SRS mixed waste streams that require treatment under RCRA.

- Twenty-five streams have existing or planned treatment capacity within the SRS waste management program. Included within the 25 are:
 - one stream that meets disposal standards without further treatment
 - one stream that meets disposal standards without further treatment, but that will require size reduction to facilitate disposal and will be macroencapsulated following size reduction in order to again meet treatment standards
 - one stream that will be treated under a variance granted by EPA
 - three high-level waste streams

- Three low-level, mixed waste streams have been consolidated with other streams, thus eliminating the need for separate treatment. The consolidated streams (and their background information) are:
 - **SR-W019 – Receiving Basin for Offsite Fuels (RBOF) High-Level Liquid Waste**
Processes have been changed to remove the hazardous characteristic from this waste stream. The previously generated waste in storage is indistinguishable from the 221-H Canyon waste stream, SR-W017, and both have been combined and are stored in the H-Area HLW Tank Farm. SR-W019 no longer exists as a separate waste stream and will be deleted from the MWIR and the FSTP.
 - **SR-W044 – Tributyl Phosphate and n-Paraffin-TRU**
This waste stream has been consolidated with the low-level waste Tributyl Phosphate and n-Paraffin, SR-W045. This stream was an organic solvent generated in the Plutonium/Uranium Extraction Process (PUREX) used in the Separations area. SR-W044 no longer exists as a separate waste stream and will be deleted from the MWIR and the FSTP.
 - **SR-W054 – Enriched Uranium Contaminated with Lead**
This waste stream was combined with the waste stream SR-W037, Nickel Plating Line Sludge, on June 28, 1994. The waste stream was an acidified analytical solution generated by the laboratory performing a total uranium analysis by Jones reduction. The waste stream was located in a laboratory satellite accumulation area. Consolidation with waste stream SR-W037 was prompted by the DOE commitment to de-inventory fissile material in the 320-M laboratory by June 30, 1994. SR-W054 no longer exists as a separate waste stream and will be deleted from the MWIR and the FSTP.
- Four mixed low-level waste streams have been deleted from further consideration because a previously forecasted waste will not be generated, or the material has been tested and is not characterized as mixed waste, or waste already has been accounted. The eliminated streams (and their background information) are:
 - **SR-W021 – Poisoned Catalyst Material**
This stream is no longer forecasted to be generated. It was to have been generated by the treatment and destruction of benzene vapors in the In-Tank Precipitation process. This stream will be deleted from the MWIR and the FSTP.
 - **SR-W040 – M-Area Stabilized Sludge**
This waste stream is a future waste stream resulting from vitrification of M-Area waste plating line solutions and sludges in the M-Area Vendor Treatment Process, and is accounted for in the analysis of waste streams SR-W004, SR-W005, SR-W029, SR-W037, SR-W038, and SR-W039.
 - **SR-W052 – Cadmium Contaminated Glovebox Section**
This waste stream was thought to contain a portion of a glovebox section that had been contaminated by a spill of cadmium containing solution. Subsequent investigation disclosed that the waste stream did not contain a glovebox section. TCLP analysis of the remaining waste in the container disclosed no cadmium or other metal contamination exceeding regulatory limits. It has been recharacterized for disposal as low-level waste. This waste stream will be deleted from the MWIR and the FSTP.
 - **SR-W057 – D-Tested Neutron Generators**
This material was shipped to SRS from the DOE Pantex site. D-tested neutron generators were mixed in error with non D-tested generators that were shipped to

SRS. D-tested material has been returned to Pantex. The waste stream no longer exists at this site and will be deleted from the MWIR and the FSTP.

- Three waste streams contain transuranic (TRU) waste and two waste streams are being managed as TRU waste, for which treatment options cannot be determined until the WIPP promulgates final waste acceptance criteria (WAC). Therefore, this document will not address treatment of these waste streams, but will instead present a TRU Waste Management Plan which describes the development of the program to provide ultimate disposal of TRU waste.
- Twenty-two low-level, mixed waste streams require in-depth options analysis (IDOA) to determine the preferred treatment option. The in-depth analysis considered five types of treatment:
 - Existing onsite treatment facilities (e.g., F- and H-Area ETF) and facilities under construction (e.g., CIF)
 - Existing production facilities with some potential capability to treat waste, or available floor space that could be refurbished to accommodate installation of treatment processes under the "Containment Building" provision of 40 CFR 265
 - Planned treatment facilities (e.g., HW/MW-TB)
 - Vendor processes operated either onsite, or at the vendor's facility
 - Waste treatment processing available from other DOE sites
- One waste was not identified on the MWIR, but was later identified during the final stages of the DSTP development. In-depth options analysis for this waste stream will be completed for issuance in the FSTP.

Initial Screening

Technology Risk Assessment & Technology Success Factor

A methodology for assessing technology risk of a process or facility based upon *Risk Management Concepts and Guidance* written by the Analytical Sciences Corporation for the Defense Systems Management College was used. The methodology was originally developed by the Department of Defense (DOD) to assist with evaluation of new weapons systems.

The "risk" assessed in a technology risk assessment is the possibility that a process under consideration may be too new and too complex to perform as required. This type of assessment is biased in favor of simple and well established technology. According to the WSRC *Conduct of Engineering Manual E7* Procedure 2.16 Technology Risk Assessment, some questions to help determine technology risk indicators include:

- Are state-of-the-art advances in technology being used in the design?
- Is the equipment exposed to a harsh or unique environment?
- Does the design require complex integration of control systems, or computer software?
- Is the design based on research and development, or does it use mathematical models for prediction?
- Is the cost of recovery from system failure high?
- Is the design evolving as construction is going on?
- Is the design new, or an extension of successful existing designs?
- Are familiar components being used in new, non-standard ways?

- Does the facility or process stand alone, or must it interface with other facilities or processes?

Technology risk assessment does not determine whether the process or system is safe. Special analyses done in the design phase of a project ensure that new processes pose no hazard to workers, the public, or the environment.

No process or facility can be simpler than its most complex part, or more mature than its newest part. Thus, a technology risk assessment begins with an examination of the whole process or facility to identify the part that has the most complex and the least mature technology. While the interaction of numerous parts and features may result in an overall process that is more complex and novel than its individual pieces, the identification of the crucial part is the first step in assessing the probability of a process or system failure.

The probability of failure (Pf) is assigned a "magnitude" based on guidance in Table 2.1. When engineering assessment indicates the factors fall between the extremes noted, other magnitudes can be assigned.

Table 2.1 – Probability of Failure

Magnitude	Maturity Factor (Pm)	Complexity Factor (Pc)
0.1	<ul style="list-style-type: none"> • Components exist • Performance requirements are specific • Design is not based on numerous, wide-ranging assumptions 	<ul style="list-style-type: none"> • Design is simple • Design is complete before installation begins • New process or facility has few interfaces with other facilities, or processes
0.5	<ul style="list-style-type: none"> • Components are used in non-standard ways • Requirements are changing • Design is based on major assumptions that have a significant impact on the design output 	<ul style="list-style-type: none"> • Design has many interconnected facets • Construction has begun on some parts of the process or facility without the whole design being finalized • Process or facility must interface with other process or facilities to achieve overall objectives
0.9	<ul style="list-style-type: none"> • Design is state-of-the-art • Research is still on-going • Functional processes have not been built • Requirements are undefined • Design is based largely on assumption instead of fact 	<ul style="list-style-type: none"> • Design is very complex • Design and construction are proceeding almost at the same time • Process or facility depends on new and extensive software • Process or facility is a vital part of an interdependent group of other facilities

Next, a magnitude is assigned to the consequence of failure (Cf). Such consequences range from minor inconveniences from which recovery is quick and inexpensive, to technical catastrophes from which recovery, if possible at all, is prolonged and costly. Table 2.2 provides the guidance for assigning the magnitude.

Table 2.2 – Consequences of Failure

Magnitude	Consequence of Failure (Cf)
0.1 (low)	Minimal, or no consequences, unimportant
0.3 (minor)	Small reduction in technical performance
0.5 (moderate)	Some reduction in technical performance
0.7 (significant)	Degradation in technical performance
0.9 (high)	Technical goal cannot be achieved

For all assessments of the technology risk of the waste treatment options, a Cf was chosen equal to 0.7. Should a preferred treatment option suffer a technical failure, it was postulated that the result would be a costly and time-consuming redesign to develop another process that could meet requirements. Until the redesign was complete and implemented, waste treatment performance would be significantly degraded.

The maturity and complexity factors are combined with the consequence factor in an equation to give the risk factor (RF):

First the maturity and complexity factors are averaged:
 $(P_m + P_c)/2 = P_f$

Then, the risk factor (RF) can be calculated:
 $RF = (P_f + C_f) - (P_f \times C_f)$

The resulting risk factor (RF) is a number between 0.19 and 0.99.
If $P_f = 0.1$ and $C_f = 0.1$, then $RF = (0.1 + 0.1) - (0.1 \times 0.1) = 0.19$
If $P_f = 0.9$ and $C_f = 0.9$, then $RF = (0.9 + 0.9) - (0.9 \times 0.9) = 0.99$

As can be seen from the above, the closer the RF is to 0.99 the greater the technology risk.

In the model used to screen and evaluate waste treatment options, numbers ranging from 0 to 100 were assigned to treatment option attributes, with high numbers representing more desirable features. To make technology risk assessment scores work the same way (high numbers indicating a low technology risk), the risk factor (RF) was converted arithmetically to a number between 0 and 100, called the Technology Success Factor (TSF). The nearness with which a TSF score approaches 100 indicates the degree of simplicity and maturity of a treatment option.

In the initial screening of treatment options, those with low (less than 50) TSF scores were discarded. This does not mean that promising, but immature, technologies will not be considered for treatment of SRS waste. It means only that at this time such technologies remain unproved and cannot be recommended in the Site Treatment Plan. Other departments at SRS are investigating and encouraging such innovative waste treatment technologies. When these technologies mature, the SRS waste management approach will allow incorporating them into the Site's waste treatment program.

In-Depth Options Analysis (IDOA)

After the elimination of those treatment options with a low possibility for technological success, most waste streams still had several viable treatment options. It became necessary to choose the "best" treatment for each waste stream. To determine the best option, all viable treatment options were subjected to an "In-Depth Options Analysis" (IDOA). Comparison among treatment options for a given waste stream is facilitated when each option can be assigned a number that reflects the degree to which the option satisfies a set of criteria or requirements. Such a number aids with the engineering assessment by which one option is

chosen over others. The method of developing a numerical ranking of treatment options is known as the IDOA Model.

The IDOA process took several steps:

1. Attributes by which all treatment processes would be analyzed were determined
2. The relative importance of the attributes was determined.
3. Each viable option received a numerical score for each attribute
4. The IDOA Model was applied to the treatment option
5. Engineering assessment took the IDOA Model results into account with other factors to determine the Preferred Option to treat a given waste stream.

The categories and attributes analyzed were:

Process Parameters

- Volume alteration
- Secondary waste generation
- Destruction, removal, and demobilization efficiency
- Flexibility
- Ability to be shipped
- Final waste form

Engineering Parameters

- System implementability
- Availability
- Scalability
- Remedial measures
- Schedule for treatment of waste

Personnel Parameters

- Consequences of unmitigated accident scenarios
- Non-operational worker potential exposure
- Operational worker potential exposure
- Transportation potential exposure

Regulatory Parameters

- Need for a variance
- Ability to obtain a permit
- Waste disposal

Public Acceptance

- Public acceptance

Cost Considerations

- Life cycle cost
- Funding availability

Industry Involvement

- Market for technology
- Private sector involvement

"Enabling statements," clarifying the above attributes, assisted with the process experts' evaluation of treatment options. The "enabling statements" appear in Table 3. The attributes and enabling statements formed the basis with which "viable" treatment processes were assessed and compared.

To evaluate a viable treatment option, a team of waste treatment process experts applied the enabling statements to each option. They assigned a number from 0 (low) to 100 (high) to each attribute. The score reflected the experts' assessment of how well the process satisfied the requirement posed by the attribute.

For example, consider the attribute of "Secondary Waste Generation." If the process produced a small quantity, all of which could be handled by existing technologies, the process experts would give the process a "high" numerical rating (median 80). If the process produced as much as 10% additional waste that existing technologies could handle, the process experts rated it "medium" (median 50). If the process produced large amounts of secondary waste, or if existing technologies could not handle the secondary waste, the experts rated it "low" (median 20). If the experts felt a score other than the median better reflected conditions, they could assign another number, provided they gave an explanation for the variation (e.g., in the preceding case, if the process produced 20% additional secondary waste, the evaluation would include a statement such as "subtract 10 points because of additional waste generation").

For the cost attribute, a team of cost estimators determined the life cycle cost. The estimators developed:

- Pre-operating cost to design and prepare initial documentation for the facility
- Facility cost to build and equip a new treatment facility, or modify an existing one
- Operating and maintenance cost for the life of the facility
- Disposal cost of all final waste forms in compliance with the LDRs
- Decontamination and decommissioning cost to return the facility to a safe and environmentally benign condition at the end of its useful life.

The process experts' evaluation resulted in a raw *technical* score for each attribute, and inclusion of the cost estimators' life cycle cost data resulted in a raw *total* score. Nevertheless, these raw scores did not reflect the relative importance of the attributes. The Technical Advisory Committee (TAC), a group of experienced technical experts with backgrounds in engineering design, environmental protection, process technology, safety, and health, appointed to oversee the treatment selection process, recognized that not applying a weighting factor to each attribute assigned the same weight to all of them. So, the Technical Advisory Committee assessed the attributes extensively to propose a weight for each factor. The weighting factors were then reviewed and modified by independent reviewers, regulators, and a citizens' focus group. The final weights appear in Table 3.3.

The weighted technical scores were summed. The total fell between 0 (least preferable) and 100 (most preferable). The sums enabled the treatment option to be ranked according to the *technical weighted score*. Then, the weighted life cycle cost data were added to the technical weighted score in a way that ensured that the cost of a treatment facility was equitably apportioned among the waste streams that would be processed using that facility. Inclusion of the weighted life cycle cost data resulted in a *total weighted score*. The IDOA model generated the technical and total weighted scores for each treatment option. These IDOA model scores were useful tools to narrow the entire population of options.

- The IDOA model ensured the same attributes were analyzed for every process or facility.
- The IDOA model provided some guidance to help make analyses consistent among the facilities.
- The IDOA model enhanced the engineering assessment by incorporating consistent structure and logic.

The application of the IDOA model assures a certain level of consistency and completeness in performing the in-depth analysis of the potential treatment options associated with each

waste stream. The primary function of the model is to narrow down the entire universe of possible treatment options to a more manageable number for further analysis and review. The model was not developed to provide a clear PO winner, and the reader is cautioned against believing that the PO having the best model score is the PO of choice. On the contrary, the application of the model results in a smaller set of POs that may have model scores within a 10 to 15% range of each other, that serve as the focus of further analysis. It was not expected, and in practice has not always been the case, that the treatment with the best model score is the PO of choice.

Sixteen of the waste streams also have treatment options proposed by outside vendors. Many of these options, however, remain unproven technologically. The vendors have primarily offered to perform studies to demonstrate that their technology can produce a waste form that will meet LDRs. A separate task team is working with the vendor proposals to determine which technologies appear worthy of further investigation. As rapidly as procurement rules allow, and as completely as budgetary constraints permit, contracts are being made with vendors to pursue the most promising innovative treatment methods.

Nonetheless, the technical viability of these technologies has been assumed and hypothetical vendor processes have been projected to permit application of the IDOA model and development of a comparison of the potential vendor processes with other treatment options. In the months ahead, successful vendors' studies will be translated into actual process designs that can be compared with the preferred options selected. This comparison will solidify the conclusions drawn from the hypothetical vendors' processes, and may reveal a vendor treatment technology for a waste stream that is preferable to the option previously favored.

Table 2.3 – Attributes and Enabling Statements For Options Analysis

Wt.	Attribute	High Score Median 80	Medium Score Median 50	Low Score Median 20
22%	PROCESS PARAMETERS			
5%	Volume Alteration	Factor of 5 reduction of waste.	Volume is maintained at 1:1 after processing.	Volume is increased by a factor of 2 or more after processing.
4%	Secondary Waste Generation	Small quantity is produced, all of which can be handled by existing technologies.	An additional amount of waste, in the range of 10%, is generated, which can be handled by existing technologies.	Large quantities produced, or existing technologies not available for treatment.
2%	Destruction Removal, and Demobilization Efficiency	All applicable LDR standards are met.	Additional LDR treatment is required for some of the constituents; technology exists.	Additional treatment is required to meet requirements, and technology does not exist, or requires modification.
3%	Flexibility	The process can treat waste streams of similar compositions to that assumed as a design basis without producing a final waste form that fails to meet requirement. Moreover the process does not need to be reconfigured or monitored with special care to meet throughput specifications.	The process can treat waste streams of similar compositions to that assumed as a design basis without producing a final waste form that fails to meet requirement, but the process must either be reconfigured or monitored with special care to meet throughput specifications.	The process cannot treat waste streams of compositions that differ from that assumed as a design basis. Special care must be taken to monitor influent streams to ensure that they conform to the composition assumed as a design basis.
2%	Ability to be Shipped	Treatment residuals meet shipping requirements without any additional treatment.	Treatment residuals require simple physical treatment to meet shipping requirements.	Treatment residuals require extensive treatment to meet shipping requirements or technologies do not exist.
6%	Final Waste Form	Meets the expected disposal WAC.	Final forms require additional treatment to meet disposal WAC; technologies exist.	Significant additional treatment is required before disposal, or technologies do not exist.

Table 2.3 – Attributes and Enabling Statements For Options Analysis (contd)

Wt.	Attribute	High Score Median 80	Medium Score Median 50	Low Score Median 20
19%	ENGINEERING PARAMETERS			
13%	System Implementability	Most of the elements and processes have been previously demonstrated on similar uses and applications.	50% or fewer of the elements have been previously demonstrated on similar uses and applications.	Few or none of the elements have been demonstrated.
3%	Availability	Key components arranged in similar systems have resulted in availability of greater than 80%.	Process is expected to be available about 50% of the time.	Process is expected to be available about 20% of the time, or large uncertainties exist in ability to predict availability.
1%	Scalability	Process can be easily expanded to take advantage of economies of scale. Also, process could be scaled from laboratory scale directly to plant scale.	Process can accept a range of input but has limitations for expansion. Also, pilot scale tests are required for meaningful testing before plant-scale design.	Process cannot be expanded to take advantage of economies of scale. Also, laboratory or pilot scale testing impractical, or would not yield meaningful results. Plant-scale design must come directly from engineering calculations.
1%	Remedial Measures	Process failure or malfunction does not create a waste that cannot be treated by other means; alternative treatment methods for the original waste exist and can be implemented within three months of recognition of need.	Process failure or malfunction creates other wastes that must be characterized to determine treatability; alternative treatment methods must be developed to treat new waste created by the process malfunction.	Process failure or malfunction creates other wastes for which there is no known treatment; no alternative methods for treatment of original waste exist.
1%	Schedule For Treatment of Waste	A schedule for addressing and processing waste can be determined with high confidence.	Some technology issues can result in uncertainty in schedule development. System complexities may negatively impact schedule duration.	Availability, technology, or flexibility issues severely limit confidence in developing schedules. Extensive training, system and operational complexity may also create problems.

Table 2.3 – Attributes and Enabling Statements For Options Analysis (contd)

Wt.	Attribute	High Score Median 80	Medium Score Median 50	Low Score Median 20
20%	PERSONNEL PARAMETERS			
6%	Consequence of Unmitigated Accident Scenarios	Little or no facility emissions for routine operations or under all but the most catastrophic accidents.	Little or no emissions for routine operations, but significant releases under most accident scenarios.	Marginally acceptable releases under routine operations or extensive releases under most accident scenarios.
6%	Non-Operational Worker Potential Exposure	Significantly less [sic.] number of workers required to construct and decommission a facility with the proposed process, as compared to other technologies, plus lower than average non-routine maintenance.	Average number of workers and non-routine maintenance required.	More complex than average facility construction, non-routine maintenance and decommissioning.
6%	Operational Worker Potential Exposure	Significantly fewer workers potentially exposed or potential exposure much lower than average.	Average number of workers and potential exposure levels.	Greater than average number of workers or greater than average potential exposure to the work force.
2%	Transportation Potential Exposure	No transportation of treated or untreated waste required.	Limited additional characterization required to support transportation, no new packaging/certification facilities required, and limited number of waste transports required.	Significant additional waste characterization required for transportation, new packaging/certification facilities required, large number of waste transports needed, or large number of miles required for each waste shipment.

Table 2.3 – Attributes and Enabling Statements For Options Analysis (contd)

Wt.	Attribute	High Score Median 80	Medium Score Median 50	Low Score Median 20
14%	REGULATORY PARAMETERS			
4%	Need For Variance	Processes are in full compliance will all applicable regulations with little or no difficulty or with no process modifications.	Processes are in partial compliance will all applicable regulations with little or no difficulty. Full compliance may be achieved through requests for variances or with limited modifications to the process.	Majority of the applicable regulations cannot be met without vast modifications to the process, or other extensive variances.
6%	Ability To Obtain A Permit	Permitting process is well-defined and relevant precedents for success have been established. Similar processes have been previously permitted by the regulatory agencies (primarily South Carolina Department of Health and Environmental Control (SCDHEC)) with little or no difficulty.	Process or key elements have been permitted elsewhere, but some key differences may exist (for example, differences in waste streams, or waste stream characterization). Similar processes have been previously permitted by the regulatory agencies (primarily SCDHEC) with moderate difficulty.	Unproved technology or significant new arena of application or need for multiple permits build in substantial permitting barriers. Similar processes have been previously permitted by the regulatory agencies (primarily SCDHEC) with extreme difficulty, or have never been previously permitted.
4%	Waste Disposal	80% of both primary and secondary wastes have been rendered non-hazardous. The other 20% remain hazardous.	50% of both primary and secondary wastes have been rendered non-hazardous. The other 50% remain hazardous.	80% of both primary and secondary wastes remain hazardous. The other 20% have been rendered non-hazardous.
9%	PUBLIC ACCEPTANCE			
9%	Public Acceptance	Stakeholders accept the process and the risks – similar processes have been publicly acknowledged by stakeholders as being acceptable.	Some stakeholder concerns that could affect successful utilization of the technology – stakeholders have publicly stated reservations about the safety or effectiveness of similar processes.	Significant stakeholder concerns about process – stakeholders have publicly stated disapproval about the safety or effectiveness of similar processes, or stakeholder opinion is unknown.

Table 2.3 – Attributes and Enabling Statements For Options Analysis (contd)

Wt.	Attribute			
15%	COST CONSIDERATIONS			
14%	Life Cycle Cost <i>Costs Developed According To DSTP Cost Guidance Rev. 1.</i> Costs are estimated for: <ul style="list-style-type: none"> • Pre-operating costs • Facility costs • Operating and maintenance costs • Disposal cost • Decontamination and decommissioning costs The SUM of the above costs is assigned a score in proportion to where it falls between \$1 and \$35 million. The higher the cost, the lower the score. Any cost totaling more than \$35 million receives a score of zero.			
Wt.	Attribute	High Score Median 80	Medium Score Median 50	Low Score Median 20
1%	Funding Availability	Life cycle costs can be supported within target budget.	Life cycle costs can be supported with less than 10% increase in target funding levels.	Line item funding required at high-levels.
1%	INDUSTRY INVOLVEMENT			
0.5%	Market For Technology	Numerous markets are identified within and outside DOE – more than three DOE and commercial nuclear facilities have similar wastes.	More than one market is identified within and outside DOE – two DOE and commercial nuclear facilities have similar wastes.	No markets or needs are identified – SRS waste is unique.
0.5%	Private Sector Involvement	Private sector technology company is identified with experience and interest and the company has experience in permitting activities – a vendor has submitted a proposal and has permitting experience.	A private sector party has expressed an interest; however, has little or no experience in this type of activity or permitting process – a vendor with non-technical experience has submitted a proposal.	No private sector companies have expressed an interest or a need for the technology.

Engineering Assessment

The last step in the IDOA was to perform an engineering assessment, taking into account the score generated by the IDOA model. While application of the IDOA model analyzed the degree to which the treatment option satisfied the requirements of the prescribed attributes, engineering assessment took a broader perspective. The engineering assessment considered other less tangible factors without which any decision making process would be shallow and superficial. The engineering assessment identified the preferred option.

Section 2.3 Coordination with Regulatory Agencies and Other Stakeholders

Coordination with Regulatory Agencies

SRS has attempted to work closely with the regulatory community to keep them abreast of STP developments. Regular meetings have been held with the South Carolina Department of Health and Environmental Control (SCDHEC) and the South Carolina Governor's Office to provide updates on the status of the DSTP development.

Public Participation

The public has been informed and invited to participate throughout the STP development process. In December 1993, a CSTP fact sheet was mailed to stakeholders on the site's public involvement distribution list. In response to the fact sheet, citizens volunteered to participate in a focus group to look at three STP development documents: the Site Treatment Plan Assumption List; Site Treatment Plan Development Flowchart; and Site Treatment Plan In-Depth Options Analysis (IDOA) Model.

The focus group, which consisted of volunteers from the general public and members of the Citizens Advisory Board (CAB), met on May 9, 1994 to give comments on the documents. Representatives of the SCDHEC also attended the meeting. SRS considered the comments and made revisions to the DSTP based on the expressed concerns.

The STP also was discussed at the SRS Waste Management Environmental Impact Statement (WM-EIS) informational workshops, held in April 1994, and the WM-EIS scoping hearings, held in May 1994.

When the DSTP is issued, SRS will issue a fact sheet summarizing the highlights of the plan and conduct DSTP public workshops and briefings for special interest groups. Information about other sites that identified SRS as a preferred option for the treatment of their mixed waste streams will be provided.

Copies of the Savannah River Site DSTP and executive summary and other sites' DSTPs will be placed in the Public Reading Room at the University of South Carolina (USC)- Aiken library. The Plan's availability and public workshops will be announced through public service announcements, newspaper, television and radio advertisements and news releases, using the site's media list. Copies of the DSTP will be mailed to stakeholders upon request.

SRS representatives will offer briefings on the highlights of the DSTP to interested community groups. Stakeholders attending the public workshops will be invited to give comments at the workshops or provide them later. Comments, also accepted through the mail, will be considered in the development of the Final STP (FSTP).

When the FSTP is issued in February 1995, copies of the SRS Plan, executive summary, and other sites' plans will be placed in the Public Reading Room at USC-Aiken. The public will be made aware of the Plan's availability through public service announcements, newspaper, television and radio advertisements and news releases, using the site's media list. A fact sheet will be developed and issued to stakeholders. Stakeholders will be informed that comments on the FSTP may be submitted to SCDHEC.

Conclusion

The SRS Site Treatment Plan Public Participation Plan is a working document that will require updating. Each activity described and each subsequently added will be designed to meet the overall program objectives, coordinate with other activities, and provide opportunity for meaningful public involvement. The overall purpose is to ensure the public participation

program for the STP is proactive, responsive to public concerns, and serves the best interests of stakeholders and the DOE.

Section 2.4 Mixed Waste Characterization

General

Westinghouse Savannah River Company (WSRC) is responsible for day-to-day management and operation of the waste management programs for the Department of Energy (DOE). The DOE provides oversight and overall direction for solid waste management programs at the SRS.

The process for defining and determining whether a waste material or stream is hazardous or nonhazardous is defined in the WSRC *Environmental Compliance Manual* (ECM) Procedure 6.03. The requirements of the ECM are applicable to WSRC and its subcontractors handling wastes and making the determination of whether the wastes are hazardous or nonhazardous as defined by the Federal Resource Conservation and Recovery Act (RCRA) and the South Carolina Hazardous Waste Management Regulations (SCHWMR). Specific guidance and requirements for making these determinations are provided in the SRS *Waste Disposal Manual*, WSRC-IM-90-138. By Memoranda of Understanding, other site organizations, such as the U. S. Forest Service, have agreed to abide by WSRC requirements when WSRC services or facilities are utilized.

As described below, SRS is composed of several major facilities, each with its own operating and support organizations. A number of these organizations play a role in characterizing waste at the SRS.

Facility Management and Environmental Coordinators

Facility Management ensures the facility is in compliance with all applicable federal/state regulations and site requirements. This includes management of waste generated and stored at the facility, including characterization of the waste prior to shipment to an onsite or offsite waste storage, treatment or disposal facility.

Each major facility, group of facilities, or operating organization has a designated Environmental Coordinator (EC) to advise and assist facility management in developing and maintaining the facility's environmental programs. The ECs are individuals knowledgeable of environmental regulations and how they apply to those facilities for which they are responsible.

ECM 6.03 requires the EC or department representative at the facility or area generating a waste must first determine whether a waste is hazardous. As discussed, knowledge of the process generating the waste and/or existing information on characteristics of the waste can be used to determine whether a given waste material is hazardous. If information to determine that a waste is hazardous is unavailable or inadequate, the waste is sampled and analyzed, provided sampling and analysis does not result in excess exposure of personnel to radiation.

The facility or area generating a waste also is responsible for preparing a waste characterization form for each routinely generated waste stream. The completed form is submitted to the Solid Waste Management (SWM) Department. The generator of a new waste must work closely with SWM and the Environmental Protection Department (EPD) to ensure the new waste can be managed under existing permits and that adequate onsite or offsite storage, treatment, disposal capacity is available, or that until sufficient waste volume is generated, satellite accumulation areas and/or 90 day staging areas are established in compliance with RCRA regulations. The generator also is responsible for determining appropriate EPA/SCDHEC hazardous waste codes and assigning appropriate SRS Hazardous

Waste Index (HWI) number(s) for quarterly hazardous waste reporting purposes. A waste characterization form also must be completed when a new hazardous waste/stream is generated or a hazardous waste generation process has changed.

Environmental Protection Department (EPD) and Office of General Counsel (OGC)

The EPD is the WSRC organization responsible for coordinating and overseeing sitewide environmental protection programs and assisting operating organizations with compliance issues including waste characterization. The WSRC OGC is consulted in all matters pertaining to environmental compliance that may have legal implications.

The *SRS Waste Disposal Manual* was prepared by EPD to provide practical guidance to SRS organizations on environmental regulations. It includes a section on the identification and characterization of hazardous waste. The manual summarizes the applicable federal and state environmental regulations and provides site guidance for identifying, characterizing, managing, transporting, treating, storing, and disposing of hazardous and nonhazardous waste. In addition, the *Waste Disposal Manual* provides guidance for waste minimization and environmental training.

The EPD issues regulatory guidance in the form of letters and memoranda to various site organizations to address specific regulatory questions as they arise. Many of these memoranda and letters are issued to provide guidance on the proper classification of a waste. These memoranda and letters are included in an appendix to the *Waste Disposal Manual*. The manual is updated periodically to incorporate changes in the regulations and add newly issued internal guidance documents. These periodic updates are issued to the custodians of each copy of the *Waste Disposal Manual* through the WSRC Document Control Section.

Sample Management Program Department

The Sample Management Program Department (SMPD) serves as the primary resource to various site waste generators during the preliminary waste identification and characterization phase. SMPD provides hazardous waste sampling services conducted in accordance with a sampling plan developed to ensure that sampling is representative, that sample collection and shipping meet regulatory protocols, and that proper analytical methods are requested. Alternatively, site organizations may collect their own samples. SMPD offers consultation services to those organizations. Technical support is available to waste generators for sampling activities involving radioactive wastes. SMPD also is developing sitewide sampling guidance. SMPD administers subcontracts with offsite analytical laboratories to support waste identification/characterization needs. To the extent possible, SMPD sends hazardous waste samples it collects to SCDHEC certified laboratories. However, in some cases, because of high radioactivity levels or need for specialized analytical techniques, analyses are conducted onsite. Hazardous, radioactively contaminated laboratory residue is returned to the site for storage. SMPD also provides technical review services for analytical data generated by offsite laboratories. Assistance on the statistical aspects of a sampling plan can be obtained from the Applied Statistics Group, Scientific Computations Section of the Savannah River Technology Center.

Solid Waste Management Department

The Solid Waste Management Department (SWMD) is responsible for management of the Low-Level Radioactive Waste Disposal Facility, the Sanitary Landfill and all interim status and permitted hazardous waste and mixed waste treatment and storage facilities except the SRTC Mixed Waste Tanks, the M-Area Mixed Waste Storage Shed, the Process Waste Interim Treatment/Storage Facility and the Organic Waste Storage Tank. SWMD also coordinates all offsite shipment and disposal of hazardous waste.

SWMD issued the *SRS Waste Acceptance Criteria Manual* (1S Manual) for developing a waste classification system for managing different wastes, establishing waste acceptance criteria (WAC) for storage and disposal facilities, and instituting a Waste Certification Program to assure the waste received for treatment, storage, or disposal at SWMD facilities meets the waste acceptance criteria (WAC).

The 1S Manual requires each generator that delivers waste to treatment, storage or disposal facilities to implement a Waste Certification Program. This program provides assurance that the requirements for waste acceptance by the receiving facility are met. Waste certification provides assurance that waste has been properly identified, characterized, segregated, packaged and shipped to the appropriate receiving facility in accordance with that receiving facility's waste acceptance criteria (WAC). Under this program, each waste generator designates a Generator Certification Official (GCO) to administer the waste generator's certification program and to assure that the waste generator's waste management programs implement and document controls to meet established waste acceptance criteria.

The SWMD reviews and assesses a waste generator's certification plan and characterization methodology and other documentation and procedures to assure compliance with the certification plan. The WSRC Quality Assurance Department is responsible for performing surveillances, audits or assessments of the waste generator's waste certification program as needed and for providing guidance and assistance for activities affecting quality.

Process Knowledge, Sampling and Analysis

Hazardous waste management regulations obligate the generator of a solid waste to "determine if that waste is a hazardous waste." To accomplish this, the generator must first determine if the waste is excluded from RCRA regulation (for example, industrial wastewater discharges regulated under the Clean Water Act). Assuming the waste is not excluded, the generator must determine if the waste is listed as a hazardous waste in 40 CFR 261, Subpart D. If unlisted, the generator is then required to determine if the waste is characteristically hazardous under 40 CFR 261, Subpart C. The generator may accomplish this by testing the waste according to the methods set forth in Subpart C, or according to an equivalent method approved under 40 CFR 260.21. The regulations also allow the generator to apply "knowledge of the hazard characteristic of the waste in light of the materials or the processes used" to make the hazardous waste determination. This approach is generally referred to as a "process knowledge" determination.

Guidance has been provided to SRS waste generators in both the Waste Disposal and 1S Manuals that the ideal way to determine if a waste is characteristically hazardous is by collecting and analyzing a representative sample of the waste. Generators are directed to *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, (EPA Publication SW-846, Third Edition, November 1986) for the methods necessary to ensure that a sampling program meets this objective. SW-846 cautions against the "haphazardly selected sample." As indicated above, technical support to waste generators is available from the SMPD for sampling activities involving radioactive wastes. SMPD also provides technical review services for waste characterization analytical data.

Although generators are strongly encouraged to make hazardous waste determinations based on representative samples, it is recognized that this is not always possible. Many of the waste streams onsite are nonhomogeneous job control or debris type waste (e.g., SR-W012, SR-W015, SR-W025, SR-W026, SR-W027, SR-W033, SR-W043, SR-W048, SR-W055, and SR-W056) making it extremely difficult to obtain a sample which is conclusively "representative."

To supplement information provided in SW-846, SRS has developed internal procedures to provide instructions to waste sampling personnel for collecting representative samples. This sampling procedure has been developed by the Analytical Laboratories Section and is found in

the Westinghouse Savannah River Company procedure manual L3.13, PRR 4326 J. This procedure was prepared using other supporting documents including "SRS Waste Analysis Group Sampling Plan Guide"; "Packaging, Labeling, and Transportation of Waste Samples", Title 49 Code of Federal Regulations; "Sampling Radioactive and Nonradioactive Hazardous Waste Drums"; "Packaging of Samples for Transportation;" "Records Management"; and Analytical Laboratories Waste Analysis Group Procedures Manual WSRC L2.

Some SRS waste streams contain levels of radioactivity sufficient to make sampling prohibitively expensive or prevent strict adherence with the sampling and analytical protocols in SW-846. Examples of waste streams where radioactivity is a significant impediment to representative sampling include: silver coated packing material (SR-W009), high-level waste from F- and H- Canyons (SR-W016 and SR-W017), gold traps (SR-W024), and radioactive oil (SR-W036). For waste streams such as these, the provision to allow characterization by process knowledge is exceptionally important when the unique difficulties presented by the radioactive component of the waste are considered. Paramount among these difficulties is the control of radiation exposure of personnel during collection, packaging, transportation and analysis of samples.

An overriding principle of working with radioactive materials is maintaining personnel exposure to radiation at levels that are "as low as reasonably achievable" or ALARA. This principle includes not only exposure of the whole body or extremities to external sources of radiation but also control of radioactive surface and airborne contamination to prevent exposures through inhalation, skin absorption or ingestion of the radioactive materials. The inhalation or ingestion of alpha emitting radionuclides is of particular concern. Alpha particles are highly energetic charged particles that can cause significant biological damage and normally have long biological half lives when deposited internally. Because of these factors, sampling, packaging, and analyzing mixed wastes that contain plutonium and other alpha emitting radioactive materials often requires personnel to use supplied breathing air and special protective clothing. Analysis of alpha emitting materials is often conducted in glove box containment systems. The presence of radioactivity also adds other administrative and regulatory requirements to transporters who must comply with Department of Transportation regulations for the transport of radioactive materials. Commercial laboratories that analyze mixed waste samples must be properly licensed to receive, analyze and dispose of radioactive materials. The processing and disposal of hazardous waste that is also radioactive requires additional specialized equipment, handling, and technologies which adequately address the radioactivity concerns in addition to the regulatory requirements for hazardous constituent.

Approximately 95% of the total volume of mixed waste being generated or currently in storage at SRS is characterized by sampling and analysis. Twelve waste streams that have not been sampled are listed waste, where waste characterization is a matter of knowing the process that generates the waste rather than levels of contaminants. In addition, a number of streams are hazardous for toxic metals that are used for their unique properties, such as Silver Coated Packing Material (SR-W009), LLW Lead (SR-W013), Gold Traps (SR-W024) and Tritiated Mercury (SR-W014), and their classification is relatively straightforward. Thus, there is a high degree of confidence that approximately 75% current or past wastes are appropriately classified. However, it is possible that some of the listed waste streams (for example, solvent rags used for cleaning and decontamination) that have not been sampled may contain trace quantities of toxic metals. Where this is known to be a possibility, other waste codes that are thought to be appropriate have been conservatively added to those waste streams.

Radiological Characterization

A variety of methods are used to characterize the radioactive component of mixed waste. This includes hand held portable monitoring instruments used by Health Protection personnel to conduct measurements of radioactivity levels in the work environment. These

Instruments are capable of measuring alpha, beta, neutron, and gamma radiation. Although less sophisticated and less precise than laboratory measurements of waste samples, this instrumentation provides the means to quantify the level of radioactivity in mixed waste for the purpose of controlling exposure of personnel to levels that are ALARA. Field measurements can also be used to provide a conservative estimate of the amount of radioactivity present. More precise determination of the amount and type of radioactive material present in a waste material can be made by analyzing a representative sample of the material in a counting or radiochemical laboratory. The sample may or may not be prepared using various chemical separation, purification and concentration techniques to enhance the overall sensitivity of the analytical technique. Typical laboratory instruments used to analyze or count prepared samples include: Gas-Flow Proportional Counters for analysis of alpha and nonvolatile beta emitters; Liquid Scintillation Counters for use in analyzing for low energy beta emitters such as tritium; Silicon Surface Barrier Detectors used for alpha particle spectroscopy measures and; High-Purity Germanium Detectors used for gamma-ray spectroscopy to identify and quantify specific gamma-emitting radionuclides.

Transuranic (TRU) waste is waste containing an alpha emitting transuranic isotope (atomic number greater than 92) with a half-life greater than 20 years and containing more than 100 nanocuries per gram (nCi/g) of radioactivity. A combination of process knowledge and instrument measurement is used to determine if a waste is TRU waste. Waste in contact with TRU material in facility gloveboxes is automatically assumed to be TRU waste and handled accordingly. This waste is placed in five gallon cans. The contents of the can is evaluated by a Pulse Height Analyzer (PHA) which measures the various energy levels of gamma rays emitted by TRU wastes. The energy profile is used to determine the quantity of TRU material in the can. In almost every case, this material is determined to be TRU waste. Waste generated from maintenance activities outside the glovebox, which may contain TRU material, is handled as TRU waste if contamination surveys are greater than the procedural limit. The combination of process knowledge and instrument readings normally leads to a conservative determination.

Section 2.5 Waste Minimization

Programs to reduce the generation of waste have been in existence at the SRS for a number of years in response to environmental regulations that require the establishment of waste minimization efforts. Such regulations include the Clean Air Act (CAA), the Clean Water Act (CWA), the Pollution Prevention Act (PPA) of 1990, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Resource Conservation and Recovery Act (RCRA). There are also a number of Department of Energy (DOE) Orders and Executive Orders (EO) addressing waste minimization.

The Land Disposal Restrictions-Federal Facility Compliance Agreement (LDR-FFCA) between the Environmental Protection Agency, Region IV (EPA-IV) and SRS, effective in March 1991 and now superseded by the LDR-FFCA Bridge Amendment effective June 20, 1994, has required a number of actions for waste minimization. These include the segregation of solvent contaminated wipes and nonhazardous waste, where possible, the substitution of nonhazardous solvents for hazardous products, the establishment of general hazardous waste minimization programs throughout SRS, and the requirement for the development of a waste minimization report with yearly updates on the progress of waste minimization activities.

In response to environmental regulations and compliance agreements described in the preceding paragraphs, SRS has developed procedures which require waste generators to participate in waste minimization activities. A Waste Minimization Group has been formed whose role is to coordinate waste minimization activities, help waste generators identify opportunities to implement waste minimization, prepare a sitewide waste minimization plan and generate the annual waste reduction report and other regular, periodic reports. To insure the programs developed by the Waste Minimization Group are initiated by the site facilities, each site organization generating waste supplies a representative to serve on the Pollution

Prevention/Waste Minimization Team. These representatives have the responsibility of advising their organizations on actions to comply with regulatory and sitewide waste minimization requirements and to assist their organizations with implementation of waste minimization activities and in remaining cognizant of opportunities for waste minimization. New training programs and support functions have been developed to keep Pollution Prevention/Waste Minimization representatives updated on waste minimization concepts and to spread awareness of waste minimization needs throughout SRS. To assist in developing proactive attitudes toward waste minimization, major waste generators must develop their own facility specific waste minimization plans. In addition, regular waste minimization surveillances and assessments are conducted both within a waste generating organization and sitewide to encourage operation of facilities with an awareness of waste minimization. For new facilities, design and operation must be conducted with waste minimization goals in mind.

These actions have helped reduce the generation rate of mixed waste in the past three years by 80%, 38%, and 96%, respectively. Some specific waste minimization actions that have occurred recently include:

- The initiation of nonhazardous substitutes for flux remover and miscellaneous industrial cleaners.
- Replacement of disposable rags and wipes for solvent removal with reusable ones.
- Purchase and use of chlorofluorocarbon and solvent recycling units.
- The substitution of process water for use as flush water in Z-Area which has reduced the generation of grout.
- Modification of the process in the M-Area Dilute Effluent Treatment Facility (DETF) to increase the particle size in the sludge filtration process, reducing the volume of filter cake generated.
- Replacement of the disposable filter media at the M-Area DETF with reusable filter media.
- Development of an affirmative procurement plan and procurement initiatives that encourage purchase of goods made from recycled material and /or products producing less, nonhazardous waste.
- Development of a Chemical Commodity Management Center (CCMC) to maintain a data base of product users compared with products in excess so that materials that might otherwise become waste can be used. The CCMC also will generate a data base to help users discover nonhazardous substitutes for their hazardous chemicals so that waste can be reduced and made easier to manage.
- Analytical techniques are being developed and refined to improve the screening of wastes for the presence of radiological contamination reducing the generation of mixed waste.
- Administrative review has modified the requirements for the development of Radioactive Materials Management Areas (RMMAs) to streamline waste management and further reduce the potential for generating mixed waste.

While reducing the generation of waste through substitution, improved control measures, and better definitions of waste streams, not all of these actions have a direct affect on the generation rates of mixed waste. However, they do represent examples of actions SRS has taken to minimize waste generation.

Users Guide For Chapters 3-5 Of Volume II Draft Site Treatment Plan

The following is provided for guidance in reviewing waste stream information in Volume II of the Draft Site Treatment Plan. Information within the guide describes the function of the charts, lists, and headings within Volume II and provides some explanation to clarify the meaning and purpose of the terminology used in the volume.

3.0.1 Waste Stream Order

At the end of this guide is Table 3.1 showing the order in which the Savannah River Site Waste streams appear in Chapters 3, 4, and 5 of the DSTP, Volume II. Waste streams are arranged by radioactivity type: mixed low-level waste (MLLW) streams in Chapter 3, mixed transuranic (MTRU) waste streams in Chapter 4, and high-level waste streams in Chapter 5. Definitions for these terms can be found in the Definitions Section 2.1.2 of Volume II.

Within each radioactivity type, waste streams are arranged by waste stream composition, such as aqueous liquid, inorganic debris, etc. Waste with the same physical form can often be treated in the same manner. Within each waste stream composition, waste streams are arranged in order of treatment option determination. Waste streams currently receiving treatment in existing, onsite facilities are first; waste streams planned for treatment at onsite facilities are next; followed by waste streams which have been determined by technical option analysis to be feasible to treat at SRS facilities. Those waste streams receiving technical option analysis are arranged roughly in the order of difficulty for determining treatment technology. Wastes shipped offsite to a vendor or other DOE facility are last within a waste matrix.

DOE-HQ guidance was used in determining the order in which mixed waste streams were placed in Volume II of the DSTP. However, the waste stream order determined for Volume II was not practical for use in Appendix A. Waste streams are arranged in Appendix A by their MWIR number. At the end of this Users Guide are two tables provided to assist the reader in locating the waste streams in Volume II and Appendix A. Table 3.1 lists the order of waste streams in Volume II. Table 3.2 is a cross reference that provides the waste streams in MWIR numerical order and lists the corresponding section number in Volume II and page number in Appendix A of the DSTP.

3.0.2 Waste Stream Analysis Information

For each waste stream, the following information is provided in a similar format.

General Information

This section contains a data description for each waste stream. Waste streams that have been deleted or consolidated are noted as such and have very little additional detail provided.

Waste Stream Number: This section provides the waste stream number and description of the determined preferred treatment option. Some of these waste streams did not undergo an in-depth option analysis in the DSTP because the analysis for these waste streams was performed as a part of the design work to justify a waste treatment facility project and identify suitable waste streams for treatment.

It should be understood that no option identified in the DSTP as a preferred option is absolutely final. As more information becomes available about cost or treatment technology and as guidance from DOE, the state, or other stakeholders is received, the preferred option may change.

The transuranic waste streams, including the mixed low-level streams with less than 100 nCi/g of transuranic radionuclides, have not undergone an option analysis. Their management is discussed in the TRU Waste Management Plan found in the beginning of Chapter 4 of this volume. The two mixed low-level waste streams with less than 100 nCi/g of transuranic radionuclides (SR-W025 and SR-W033) need further characterization before their option analysis can be performed. They are discussed in Section 3.3 and Chapter 4.

Background Information: This section provides a brief description of the waste stream along with:

Volume: Both a current storage volume and a future generation volume number in cubic meters (m³). (More information about volume reporting and convention is provided later in the guide under "Reporting Inventories and Reporting Convention.")

Waste Stream Composition: Provides information about the physical form of the waste and serves as a major heading under which like streams are grouped.

Waste Codes: Lists the RCRA waste code classification of the contaminants present in the waste.

LDR Treatment Standards: Provides treatment information from the RCRA regulations regarding LDR requirements for the waste stream.

Waste Characterization: Describes the analytical identity of the waste stream and the confidence level of the information listed. The basis for waste characterization is either by sampling and analysis or by process knowledge. The confidence level for either method of waste characterization for the hazardous waste constituent is expressed as high, medium, or low.

A high confidence level reflects detailed knowledge of the waste through extensive sampling and analysis, which may include regulatorily prescribed tests, such as TCLP, or by process knowledge which is based on process specification or design, reliable mass balance calculation, or other controlled and accurate information.

A medium confidence level is based on partial sampling and analysis or the use of test methods that do not provide the most accurate results. Medium process knowledge confidence is based on indirect or less controlled knowledge which enables conclusions to be drawn about contaminants in a waste, but with uncertainty concerning contaminant levels.

A low confidence level indicates no sampling and analysis data or highly uncertain data due to chemical or radiological interference. A low confidence level for process knowledge indicates a great amount of uncertainty about the characterization of the waste. Only a few SRS waste streams have a low confidence level. These streams are addressed in a conservative manner in the treatment option analysis performed in the DSTP.

Radiological Characterization: Describes the radiochemical identity of the waste; whether the waste is remote handled or contact handled, the radioactivity type (MLLW, MTRU, HLW) and the radionuclides present, if available.

Technology and Capacity Needs

The second part of the discussion on each waste stream in Volume II deals with the treatment technology. Where a technical analysis has been performed, a flow diagram of the process steps is provided. Information is listed concerning the LDR treatment standards for the waste stream. Justification is provided for how the treatment option meets the regulatory standard

if an IDOA has been performed. Where applicable, supplemental information is provided concerning why the pretreatment option was chosen. Information is given on capacity requirements to treat the waste and what treatment facility needs must be met to facilitate treating the waste.

Treatment Option Information

This part discusses the type of treatment technology and other technical features regarding the identified treatment option. Information is provided on the operational and regulatory status of the treatment option. For onsite treatment options, a description of the action needed to bring the facility into operation is given if applicable. Discussion of offsite DOE facilities lists the facility status.

Treatment Option Status and Uncertainties

A status on the budget requirements for the treatment option and known external uncertainties of a budgetary, technical or administrative nature, are provided.

MLLW in Sections 3.2 and 3.3 are described with a slightly modified format than that described above. Section 3.2 addresses waste streams which do not have an identified technology and must undergo further technology development, or request a treatability variance. Section 3.3 contains MLLW streams being managed as MTRU and require further waste characterization.

MTRU in Chapter 4 have a three part description which includes General Information, Technology and Capacity Needs, and Treatment Option Status and Uncertainty Issues.

The description format for waste streams in Chapter 5 follows the same outline for the waste streams in Section 3.1.

3.0.3 Reporting Inventories and Reporting Convention

Both the Interim Mixed Waste Inventory Report (IMWIR) and the Final Mixed Waste Inventory Report (FMWIR) were snapshots of the current SRS mixed waste inventory and a five year estimate of waste generation based on best knowledge at the time the data were collected. The data collection effort involved all the generators at SRS, and those involved in the storage and treatment of mixed waste; therefore, many individuals contributed the regulatory, technical and physical inventory data. Data from the generators have differences in the use of significant digits, rounding procedures, etc. With the goal of providing consistency in data reporting, the SRS DSTP established a set of guidelines on how the waste volumes would be reported and presented in the text of Volumes I and II and Appendix A. This same procedure will be used for the next MWIR data call as well as the FSTP. Using this approach provides a conservative picture of the mixed waste inventories, and does not significantly change the previously reported values. Similarly, this approach will result in discrepancies with some of the inventories reported in the MWIR by DOE-HQ but the magnitude of the discrepancies is small. The SRS approach is to report waste volumes (i.e., gross or net volumes) in a way that allows the most accurate prediction of the mixed waste treatment capacity required.

The following guidelines have been applied in reporting the waste stream volumes in all DSTP tables and waste stream data:

- Volume of mixed wastes stored in tanks will be reported as net volume.
- Volume of containerized waste (drum, box, etc.) will be reported as gross volume.
Exceptions:

- SR-W009 Silver Coated Packing Material reported as net volume (14-ton overpacks overstate waste stream volume)
- SR-W013 LLW Lead reported as net volume due to many older boxes in storage filled only partially; over 100 m³ difference due to void spaces.
- SR-W023 Cadmium Safety/Control Rods reported as net volume since the waste form is not in a drum or box. Current storage for failed rods is in a container in satellite accumulation areas in the reactor disassembly basins while functional rods are in the reactor vessels waiting to be decommissioned.
- All volume numbers will be rounded to the nearest drum (0.2 m³) with the exception of wastes in satellite accumulation areas, which will be reported as 0.1 m³ for volumes equal to or less than this value.
- The use of rounding and significant numbers will be appropriately applied considering how the waste is stored. For the high-level waste tanks, the volumes will be expressed to reflect the accuracy of the measurement rather than rounded to the nearest cubic meter.

In addition, a significant volume change to the 1993-1997 projected volume for waste stream SR-W022 (DWPF Benzene) was made in response to new information enabling SRS to better determine the generation of this future SRS mixed waste stream. This change was made after the submittal for the FMWIR data call. This number also coincides with the value reported in the Waste Management Environmental Impact Statement (WM-EIS).

3.0.4 Land Disposal Restrictions (LDR) Regulations Summary

Each contaminant regulated by RCRA is given a waste code (for example D008 or F006). The waste code either identifies the contaminant, or the industrial process creating the waste, or both. For some of the other waste codes, DOE has assigned a letter suffix to further identify a waste stream matrix (for example, D008A describes a waste that is hazardous for lead content, D008B describes lead in the form of lead/acid batteries, and D008C describes lead in the form of radioactive lead solids).

For each waste stream in Volume II, LDR data provides the concentration based treatment standard or range of standards or the specified technology required to be met by the LDR regulations. If the waste stream meets the LDR definition of debris, one of seventeen alternative debris technologies may be applied to meet the LDR regulations or the waste may be treated to meet the waste specific treatment standard. These standards were developed for waste that is to be disposed of in the land (defined as landfills, surface impoundments, waste piles, injection wells, land treatment units, salt dome or salt bed formations). The treatment standards, set by EPA, must be met before the waste can be land disposed. The standards are usually a concentration level in the waste based on Toxicity Characteristic Leaching Procedure (TCLP) test results or total composition analysis results. The standards vary based on whether the waste stream is a wastewater, which is water contaminated with less than 1% total organic carbon (<1% TOC) and with less than 1% total suspended solids (<1% TSS); or a nonwastewater, which is everything else. For F001-F005 listed wastes, the definition of wastewater is less than 1% by weight total organic carbon (<1% TOC) for the solvent water mixture or the F001-F005 solvent constituent listed in 40 CFR Part 268.41. In determining the concentration based treatment standards, EPA has examined data from various treatment methods and determined which method is the best (and commercially available) for treating each waste code. That method has been identified as the Best Demonstrated Available Technology (BDAT). Wastes are not required to be treated by the BDAT. Any treatment method may be used, but where concentration based standards exist for a waste code, that standard must be met regardless of the treatment method employed. The BDAT is simply the

treatment method that EPA examined and used in developing the concentration based treatment standards for the LDR program.

In some cases, the nature of the waste makes chemical analysis of a treated waste form very difficult or unreliable. In these cases, EPA has required a treatment method called a specified technology to be performed before land disposal. When specified technologies are identified as the treatment standard for a particular waste code, that technology must be used to treat that waste (alternative treatments would only be allowed if a treatability variance were submitted and approved or regulatory discretions were granted).

In addition to setting those standards noted above, EPA also has recognized that these treatment standards were developed based upon determination of the BDAT for the "normal" waste stream matrices such as electroplating sludges, paint thinners, solvents, etc. EPA believes that treatment standards based on BDATs for these waste matrices are not appropriate for treating wastes with a significantly different physical form, such as soil, rocks, equipment, plastic, etc. Therefore, EPA issued treatment standards specifically for debris (these regulations were published in the August 18, 1992 Federal Register) and has committed to issuing treatment standards specifically for soil (regulations still under development at EPA). Until such time as the new soil standards are issued, soils receiving treatment must meet the treatment standards promulgated for the "normal" waste streams as noted.

3.0.5 Specified Technology Treatment Requirements

The following are regulatory definitions regarding specific treatment technology requirements for particular waste streams from the LDR regulations. These are not all the definitions but are the ones used in listing treatment requirements for SRS mixed waste streams. These definitions are listed here as well as in Chapter 2 for ease of reference

ADGAS – Venting of compressed gases into an absorbing or reacting media (i.e., solid or liquid) – venting can be accomplished through physical release utilizing valves/piping; physical penetration of the container; and or penetration through detonation.

AMLGM – Amalgamation of elemental mercury contaminated with radioactive materials utilizing inorganic reagents such as copper, zinc, nickel, gold, and sulfur that results in a nonliquid, semi-solid amalgam and thereby reducing potential emissions of elemental mercury vapors to the air.

CHOXD – Chemical or electrolytic oxidation utilizing the following oxidation reagents (or waste reagents) or combinations of reagents: (1) hypochlorite (e.g., bleach); (2) chlorine; (3) chlorine dioxide; (4) ozone or UV (ultraviolet light) assisted ozone; (5) peroxides; (6) persulfates; (7) perchlorates; (8) permanganates; and/or (9) other oxidizing reagents of equivalent efficiency, performed in units operated such that a surrogate compound or indicator parameter has been substantially reduced in concentration in the residuals (e.g., Total Organic Carbon can often be used as an indicator parameter for the oxidation of many organic constituents that cannot be directly analyzed in wastewater residues). Chemical oxidation specifically includes what is commonly referred to as alkaline chlorination.

DEACT – Deactivation to remove the hazardous characteristic of a waste due to its ignitability, corrosivity and/or reactivity.

FSUBS – Fuel substitution in units operated in accordance with applicable technical operating requirements.

HLVIT – Vitrification of high-level mixed radioactive waste in units in compliance with all applicable radioactive protection requirements under control of the Nuclear Regulatory Commission.

IMERC – Incineration of wastes containing organics and mercury in units operated in accordance with the technical operating requirements of 40 CFR Part 264 Subpart O and Part 265 Subpart O. All wastewater and nonwastewater residues derived from this process must then comply with the corresponding treatment standards per waste code with consideration of any applicable subcategories (e.g., High or Low Mercury Subcategory).

INCIN – Incineration in units operating in accordance with the technical operating requirements of 40 CFR Part 264 Subpart O and Part 265 Subpart O.

MACRO – Macroencapsulation with surface coating materials such as polymeric organics (e.g., resins and plastics) or with a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media.

NEUTR – Neutralization uses these chemicals either alone or in combination: (1) acids; (2) bases; or (3) water (including wastewaters) resulting in a pH greater than 2 but less than 12.5 as measured in the aqueous residuals.

RLEAD – Thermal recovery of lead in secondary lead smelters.

RMERC – Retorting or roasting in a thermal processing unit capable of volatilizing mercury and subsequently condensing the volatilized mercury for recovery. The retorting or roasting unit (or facility) must be subject to one or more of the following: (a) A National Emissions Standard for Hazardous Air Pollutants (NESHAP) for mercury; (b) a Best Available Control Technology (BACT) or a Lowest Achievable Emission Rate (LAER) standard for mercury imposed pursuant to a Prevention of Significant Deterioration (PSD) limit; or (c) a state permit that establishes emission limitations (within meaning of section 302 of the Clean Air Act) for mercury. All wastewater and nonwastewater residues derived from this process must then comply with the corresponding treatment standards per waste code with consideration of any applicable subcategories (e.g., High or Low Mercury Subcategory).

RMETL – Recovery of metals or inorganics utilizing one or more of the following direct physical/removal technologies: (1) ion exchange; (2) resin or solid (i.e., zeolites) adsorption; (3) reverse osmosis; (4) chelation/solvent extraction; (5) freeze crystallization; (6) ultrafiltration and/or (7) simple precipitation (i.e., crystallization). Note: This does not preclude the use of other physical phase separation or concentration techniques such as decantation, filtration, (including ultrafiltration) and centrifugation, when used in conjunction with the above listed recovery technologies.

RORGS – Recovery of organics utilizing one or more of the following technologies: (1) Distillation; (2) thin film evaporation; (3) steam stripping; (4) carbon adsorption; (5) critical fluid extraction; (6) liquid - liquid extraction; (7) precipitation/crystallization (including freeze crystallization); or (8) chemical phase separation techniques (i.e., addition of acids, bases, demulsifiers, or similar chemicals); – Note: this does not preclude the use of other physical phase separation techniques such as decantation, filtration (including ultrafiltration), and centrifugation, when used in conjunction with the above listed recovery techniques.

RTHRM – Thermal recovery of metals or inorganics from nonwastewaters in units identified as industrial furnaces according to 40 CFR 260.10 (1), (6), (7), (11), and (12) under the definition of "industrial furnaces."

STABL – Stabilization with the following reagents (or waste reagents) or combinations of reagents:
(1) Portland cement; or (2) lime/pozzolans (e.g., fly ash and cement kiln dust) – this does not preclude the addition of reagents (e.g., iron salts, silicates, and clays) designed to enhance the set/cure time and/or compressive strength, or to overall reduce the leachability of the metal or inorganic.

Table 3.1 – DSTP Volume II Waste Stream Order

Section 3.1 SRS Mixed Low-Level Waste Streams with Existing Treatment Technology

3.1A Aqueous Liquids

- 3.1A.1 SRL (SRTC) Low Activity Waste, SR-W007
- 3.1A.2 SRL (SRTC) High Activity Waste, SR-W008
- 3.1A.3 Mercury Contaminated Heavy Water, SR-W032
- 3.1A.4 Nickel Plating Line Solution, SR-W039
- 3.1A.5 Consolidated Incinerator (CIF) Blowdown, SR-W047
- 3.1A.6 Uranium/Chromium Solution, SR-W031
- 3.1A.7 Aqueous Mercury and Lead, SR-W041A

3.1B Cemented Solids

- 3.1B.1 M-Area Sludge Treatability Samples, SR-W029

3.1C Lead

- 3.1C.1 LLW Lead (Uncombined Elemental Lead), SR-W013A
- 3.1C.2 LLW Lead (Combined Lead), SR-W013B

3.1D Heterogeneous Debris

- 3.1D.1 Spent Filter Cartridges, SR-W051

3.1E Inorganic Debris

- 3.1E.1 In-Tank Precipitation Filters, SR-W020
- 3.1E.2 Cadmium Safety/Control Rods, SR-W023
- 3.1E.3 Mercury Contaminated Equipment, SR-W015
- 3.1E.4 Aqueous Mercury and Lead (Mercury Contaminated Recorder), SR-W041C
- 3.1E.5 Cadmium Coated HEPA Filters, SR-W011

3.1F Inorganic Sludges and Particulates

- 3.1F.1 M-Area Plating Line Sludge from Supernate Treatment, SR-W004
- 3.1F.2 Mark 15 Filter Cake, SR-W005
- 3.1F.3 M-Area Nickel Plating Line Sludge, SR-W037
- 3.1F.4 Plating Line Sump Material, SR-W038
- 3.1F.5 Consolidated Incinerator (CIF) Ash, SR-W046
- 3.1F.6 Tank E-3-1 Clean Out Material, SR-W049

3.1G Liquid Mercury

- 3.1G.1 Gold Traps, SR-W024
- 3.1G.2 Tritiated Mercury, SR-W014
- 3.1G.3 Aqueous Mercury and Lead (Elemental Mercury), SR-W041B

3.1H Organic Debris

- 3.1H.1 Solvent Contaminated Debris (LLW), SR-W003
- 3.1H.2 Toxic Clean Up Material, SR-W012
- 3.1H.3 Filter Paper Take Up Rolls, SR-W018
- 3.1H.4 Mark 15 Filter Paper – F006, SR-W028
- 3.1H.5 Laboratory Waste with Tetraphenyl Borate, SR-W043
- 3.1H.6 Job Waste Containing Solvent Contaminated Wipes, SR-W055
- 3.1H.7 Job Waste with Enriched Uranium and Solvent Applicators, SR-W056

3.1I Organic Liquids

- 3.1I.1 Rad-Contaminated Solvents, SR-W001
- 3.1I.2 Rad-Contaminated Chlorofluorocarbons, SR-W002
- 3.1I.3 Scintillation Solution, SR-W010
- 3.1I.4 Defense Waste Processing Facility (DWPF) Benzene, SR-W022

- 3.1I.5 Spent Methanol, SR-W030
- 3.1I.6 Freon 11/Oil, SR-W035
- 3.1I.7 Tributyl Phosphate and n-Paraffin, SR-W045
- 3.1I.8 Tetrabutyl Titanate, SR-W059

3.1J Organic Sludges and Particulates

- 3.1J.1 Paints and Thinners, SR-W042

3.1K Reactive Metals

- 3.1K.1 Calcium Metal, SR-W034

3.1L Soils

- 3.1L.1 Waste Sites/Spill Site Soils, SR-W048

Section 3.2 Waste Streams for Which Treatment Technology Needs Adaptation

3.2A Organic Liquid

- 3.2A.1 Radioactive Oil, SR-W036

3.2B Uncategorized Inorganic Particulate

- 3.2B.1 Silver Coated Packing Material, SR-W009

Section 3.3 Waste Streams in Need of Further Characterization

3.3A Organic Debris

- 3.3A.1 Solvent Waste <100 nCi/g TRU, SR-W025
- 3.3A.2 Thirds Waste <100 nCi/g TRU Rad, SR-W033

Chapter 4.0 SRS Mixed Transuranic (TRU) Waste Streams

Section 4.1 SRS Mixed Transuranic (TRU) Waste Streams Destined for the Waste Isolation Pilot Plant

4.1A Organic Debris

- 4.1A.1 Thirds TRU Waste, SR-W026
- 4.1A.2 Solvent TRU Waste, SR-W027

4.1B Organic Liquid

- 4.1B.1 Mixed TTA/Xylene, SR-W006

Section 4.2 Other SRS Mixed Transuranic (TRU) Waste Streams

4.2A Inorganic Sludges and Particulates

- 4.2A.1 Rocky Flats Incinerator Ash, SR-W053

Chapter 5.0 SRS High-Level Waste Streams

5.1A Aqueous Liquids

- 5.1A.1 221-F Canyon High-Level Liquid Waste, SR-W016
- 5.1A.2 221-H Canyon High-Level Liquid Waste, SR-W017

5.1B Glass Debris

- 5.1B.1 Mixed Sludge Waste with Mercury from DWPF Treatability Studies, SR-W058

5.1C Inorganic Sludges and Particulates

- 5.1C.1 Mixed Waste to Support High-Level Waste Processing Demonstrations, SR-W050

Table 3.2
Comparison of Waste Stream Locations – DSTP Volume II and Appendix A

Waste Stream No.	Waste Stream Name	Volume II Section Identification	Appendix A Page No.
SR-W001	Rad-Contaminated Solvents	3.1I.1	39
SR-W002	Rad-Contaminated Chlorofluorocarbons	3.1I.2	43
SR-W003	Solvent Contaminated Debris (LLW)	3.1H.1	45
SR-W004	M-Area Plating Line Sludge from Supernate Treatment	3.1F.1	49
SR-W005	Mark 15 Filter Cake	3.1F.2	53
SR-W006	Mixed TTA/Xylene	4.1B.1	57
SR-W007	SRL (SRTC) Low Activity Waste	3.1A.1	59
SR-W008	SRL (SRTC) High Activity Waste	3.1A.2	63
SR-W009	Silver Coated Packing Material	3.2B.1	67
SR-W010	Scintillation Solution	3.1I.3	89
SR-W011	Cadmium Coated HEPA Filters	3.1E.5	93
SR-W012	Toxic Cleanup Material	3.1H.2	121
SR-W013A	Low-Level Waste Lead (Uncombined Elemental Lead)	3.1C.1	125
SR-W013B	Low-Level Waste Lead (Combined Lead)	3.1C.2	141
SR-W014	Tritiated Mercury	3.1G.2	163
SR-W015	Mercury Contaminated Equipment	3.1E.3	179
SR-W016	221-F Canyon High Level Liquid Waste (HLW)	5.1A	193
SR-W017	221-H Canyon High Level Liquid Waste (HLW)	5.1A.2	197
SR-W018	Filter Paper Take Up Rolls	3.1H.3	199
SR-W019	244-H RBOF High Activity Liquid Waste	2.2.2	223
SR-W020	In-Tank Precipitation (ITP) Filters	3.1E.1	225
SR-W021	Poisoned Catalyst Material	2.2.2	229
SR-W022	Defense Waste Processing Facility(DWPF) Benzene	3.1I.4	231
SR-W023	Safety/Control Rods	3.1E.2	235
SR-W024	Gold Traps	3.1G.1	239
SR-W025	Solvent Waste <100 nCi/g TRU	3.3A.1	243
SR-W026	Thirids TRU Waste	4.1A.1	245
SR-W027	Solvent TRU Waste	4.1A.2	247
SR-W028	Mark 15 Filter Paper – F006	3.1H.4	249
SR-W029	M-Area Sludge Treatability Samples	3.1B.1	269
SR-W030	Spent Methanol Solution	3.1I.5	271
SR-W031	Uranium/Chromium Solution	3.1A.6	275
SR-W032	Mercury Contaminated Heavy Water	3.1A.3	299
SR-W033	Thirids Waste <100 nCi/g TRU Rad	3.3A.2	301
SR-W034	Calcium Metal	3.1K.1	303
SR-W035	Freon 11/Oil Mixture	3.1I.6	321
SR-W036	Radioactive Oil	3.2A.1	323
SR-W037	M-Area High Nickel Plating Line Sludge	3.1F.3	325
SR-W038	Plating Line Sump Material	3.1F.4	329
SR-W039	Nickel Plating Line Solution	3.1A.4	333
SR-W040	M-Area Stabilized Sludge	2.2.2	337

Waste Stream No.	Waste Stream Name	Volume II Section Identification	Appendix A Page No.
SR-W041A	Aqueous Mercury and Lead	3.1A.7	339
SR-W041B	Aqueous Mercury and Lead (Elemental Liquid Mercury)	3.1G.3	361
SR-W041C	Aqueous Mercury and Lead (Mercury Contaminated Recorder)	3.1E.4	375
SR-W042	Paints and Thinners	3.1J.1	381
SR-W043	Lab Waste w/Tetraphenyl Borate	3.1H.5	393
SR-W044	Tributyl Phosphate & N-paraffin – TRU	4.0	405
SR-W045	Tributyl Phosphate & N-Paraffin	2.2.2	407
SR-W046	Consolidated Incinerator (CIF) Ash	3.1F.5	417
SR-W047	Consolidated Incinerator (CIF) Blowdown	3.1A.5	419
SR-W048	Waste Sites/Spill Site Soil	3.1L.1	435
SR-W049	Tank E-3-1 Clean Out Material	3.1F.6	469
SR-W050	Mixed Waste to Support HL Waste Processing Demonstrations	5.1C.1	481
SR-W051	Spent Filter Cartridges	3.1D.1	483
SR-W052	Cadmium Contaminated Glovebox Section	2.2.2	503
SR-W053	Rocky Flats Incinerator Ash	4.2A.1	505
SR-W054	Enriched Uranium Contaminated with Lead	2.2.2	513
SR-W055	Job Waste Containing Solvent Contaminated Wipes	3.1H.6	515
SR-W056	Job Waste with Enriched Uranium and Solvent Applicators	3.1H.7	533
SR-W057	D-Tested Neutron Generators	2.2.2	545
SR-W058	Mixed Sludge Waste with Mercury-DWPF Treatability Studies	5.1B.1	547
SR-W059	Tetrabutyl Titanate (TBT)	3.1I.8	549
SR-W060	Tritiated Water with Mercury	6.3	561

CHAPTER 3 LOW-LEVEL MIXED WASTE STREAMS

Section 3.1 Waste Streams with Existing Technology

Section 3.1A Aqueous Liquids

3.1A.1 SRL (SRTC) Low Activity Waste

3.1A.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W007

The preferred treatment option for SRTC Low Activity Waste is Ion Exchange and Neutralization in the SRTC Low Activity Waste Storage Tanks.

Background Information

A waste stream generated by laboratory research, development, and analytical programs at the Savannah River Technology Center (SRTC). The waste comes from laboratories and radiobenches where drains go to the low activity mixed waste storage tanks and have a total activity of less than 1,000 disintegrations per minute per milliliter (d/m/ml).

Volume

- Current volume through 09/30/93 is 71.5 m³.
- Expected volume 1993-1997 will be 375 m³.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D002A (corrosive), D007A (TCLP Cr), D008A (TCLP Pb), D009A (TCLP Hg), D018 (benzene) nonwastewater

LDR Treatment Standard

- D002A = specified technology – Deactivation
- D007A-D009A = concentration based standard = 0.2-5.0 mg/l
- D018 = no treatment standard yet developed by EPA

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high.
- TCLP results include benzene <5 mg/l, Cr = 0.55 mg/l, Pb = 0.15 mg/l, Hg = 0.1 mg/l.

Radiological Characterization

- Sampling indicates total activity ≤ 1000 d/m/ml beta/gamma.
- Alpha emitter is <10 nCi/g.
- Waste is contact handled.
- Mixed low-level waste
- Isotopes present include Cs¹³⁷, H³, and U²³⁵.

3.1A.1.2 TECHNOLOGY AND CAPACITY NEEDS

The required LDR standards for the waste codes in this waste stream are concentration based standards, except for the D002A waste code. There is a specified technology for the D002A waste code of deactivation. For corrosive waste, deactivation requires an adjustment of the pH by neutralization until the waste no longer exhibits a characteristic for corrosivity i.e., the pH remains between 2 and 12.5 pH units. For chromium and lead, the concentration based

standard is 5.0 mg/l based on a TCLP test. For mercury, the concentration based standard is 0.2 mg/l also from TCLP test results. There is no treatment standard for benzene at this time.

Treatment of this aqueous waste stream with ion exchange resins used to remove metals and organics is on-going. The acid in this waste is also neutralized as a normal part of tank processing. The treatment standards are met with this technology.

The treatment capacity of ion exchange and neutralization in the SRTC Low Activity Waste Storage Tanks is 1500 m³/yr which provides sufficient capacity to treat existing waste volumes, plus those estimated to be generated over the five year projection period of the MWIR (75 m³/yr).

3.1A.1.3 TREATMENT OPTION INFORMATION

The waste stream is treated at an existing treatment facility, the Low Activity Mixed Waste storage tank. The treatment method is by ion exchange probe and neutralization. The ion exchange resin bonds the contaminants and prevents them from leaching, thus removing the hazardous characteristic and rendering the waste non-hazardous. Waste also is neutralized, if applicable. Spent resin has passed TCLP for the hazardous constituents of concern. Because the resins are not hazardous waste, they can be disposed of as low-level radioactive waste. Prior to treatment, waste streams are analyzed. Resins used are specific to the contaminant to be removed. Different resins are used in removing metals versus removing organics.

The facility is currently operating under RCRA Interim Status.

3.1A.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

The facility is funded as a part of the operating costs of the support facilities serving SRTC. The estimated cost to treat this waste stream is less than \$200 thousand.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.1A.2 SRL (SRTC) High Activity Waste

3.1A.2.1 GENERAL INFORMATION

Waste Stream Number: SR-W008

The preferred treatment option for the SRTC High Activity Waste is Ion Exchange and Neutralization in the SRTC High Activity Waste Storage Tanks.

Background Information:

This waste stream is generated by laboratory research, development, and analytical programs at the Savannah River Technology Center (SRTC). The waste comes from cupsinks in radiologically controlled hoods or gloveboxes and usually has a total activity of more than 1,000 disintegrations per minute per milliliter (d/m/ml).

Volume

- Current volume through 09/30/93 is 77.4 m³.
- Expected 1993-1997 volume will be 375 m³.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D002A (corrosive), D007A (TCLP Cr), D008A (TCLP Pb), D009A (TCLP Hg), D018 (benzene) nonwastewater

LDR Treatment Standard

- D002A = specified technology – Deactivation
- D007A-D009A = concentration based standard = 0.2-5.0 mg/l
- D018 = no treatment standard yet developed by EPA

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high due to availability of TCLP analysis.
- Typical value for mercury is 0.076 mg/l.

Radiological Characterization

- Radioactive isotopes present may include: Pu²³⁹, U²³⁵, Am²⁴¹, Co⁶⁰, Sb¹²⁵, Cs¹³⁷, Eu¹⁵⁴, Eu¹⁵⁵, Cs¹³⁴, Eu¹⁵⁴, H³.
- Mixed low-level waste
- Waste is contact handled.

3.1A.2.2 TECHNOLOGY AND CAPACITY NEEDS

The required LDR standards for the waste codes in this waste stream are concentration based standards, except for the D002A waste code. There is a specified technology for the D002A waste code of deactivation. For corrosive waste, deactivation requires an adjustment of the pH by neutralization until the waste no longer exhibits a characteristic for corrosivity i.e., the pH remains between 2 and 12.5 pH units. For chromium the concentration based standard is 5.0 mg/l based on a TCLP test. For lead, the concentration based standard is 5.0 mg/l from TCLP test results. For mercury, the concentration based standard is 0.2 mg/l also from TCLP test results. There is no treatment standard for benzene at this time.

Treatment of this aqueous waste stream with ion exchange resins used to remove metals and organics is on-going. The acid in this waste also is neutralized as a normal part of tank processing. The treatment standards are met with this technology.

Treatment capacity of ion exchange and neutralization in SRTC high activity waste tanks is 210 m³/yr which provides sufficient capacity to treat existing waste volumes plus those estimated to be generated over the five year projection period of the MWIR (75 m³/yr).

3.1A.2.3 TREATMENT OPTION INFORMATION

The waste stream is treated at an existing treatment facility; the High Activity Mixed Waste storage tank. Treatment method is by ion exchange probe and neutralization. The ion exchange resin bonds the contaminants and prevents them from leaching, thus removing the hazardous characteristics and rendering the waste non-hazardous. The waste also is neutralized if applicable. Spent resin has passed TCLP for the hazardous constituents of concern. Because the resins are not hazardous waste, they can be disposed as low-level radioactive waste. Prior to treatment, waste streams are analyzed. Resins are utilized specific to the contaminant to be removed. Different resins are used in removing metals versus removing organics.

The facility is currently operating under RCRA Interim Status.

3.1A.2.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

The facility is funded as a part of the operating costs of the support facilities serving SRTC. The estimated cost to treat this waste stream is less than \$200 thousand.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.1A.3 Mercury Contaminated Heavy Water

3.1A.3.1 GENERAL INFORMATION

Waste Stream Number: SR-W032

The preferred treatment option for Mercury Contaminated Heavy Water is recycling in the D-Area Heavy Water Operations Facility through utilization of an Ion Exchange resin. Ion exchange and heavy water recycling processes exist in the D-Area facilities. SRS is currently developing a plan to treat SR-W032 prior to 10/95 to take advantage of the facility's processing capability prior to shutdown (scheduled for FY97). If treatment is completed prior to 10/95, this waste stream will be removed from the STP.

Background Information:

This waste was generated in the Heavy Water Operations Laboratory during analytical testing where mercury (II) chloride was used in the testing procedure.

Volume

- Current volume through 09/30/93 is 9.6 m³.
- No future waste generation is expected because the laboratory has modified the test using mercury as a tracing agent since the test generated a mixed waste.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D009A (TCLP Hg) wastewater

LDR Treatment Standard

- D009 = concentration based standard = 0.2 mg/l

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level high is due to sample analysis results.

Radiological Characterization

- Calculated activity varies. Average reading is 290 nCi/g.
- Tritium is present.
- Waste is contact handled.
- Mixed low-level waste

3.1A.3.2 TECHNOLOGY AND CAPACITY NEEDS

The treatment standard for this waste is 0.2 mg/l total mercury in the treated waste.

The technology exists and the equipment is presently available at SRS to remove the mercury from this heavy water stream and allow the heavy water to be recycled for reuse. This not only provides a waste minimization solution for the management of this material, but meets the LDR standard for mercury treatment in a cost effective manner.

This is a one time waste treatment, and the heavy water component will be placed in the heavy water inventory at SRS. The D-Area Heavy Water Operations Facility has the capacity to handle, on the average, 55 gallons per day of the mercury contaminated heavy water through the ion exchange equipment. The mercury loading capacity of the ion exchange probe is directly related to the concentration of the contaminant to be removed.

3.1A.3.3 TREATMENT OPTION INFORMATION

Mercury will be removed through utilization of an ion exchange resin developed by the Savannah River Technology Center (SRTC). The resin chemically bonds metals including mercury so that they do not leach. The resin itself, because the metals do not leach, passes a TCLP test and can be disposed as nonhazardous, low-level radioactive waste when it is exhausted.

Since the Mercury Contaminated Heavy Water is being recycled rather than treated for disposal, a treatment permit is not required under RCRA regulations. However, storage of this material prior to recycling will be in a RCRA facility.

SRS has reached an agreement with the South Carolina Department of Health and Environmental Control (SCDHEC) to transfer a portion of the site hazardous waste storage capacity to D-Area so that the 46 drums of Mercury Contaminated Heavy Water can be moved to D-Area for temporary storage while processing for recycling the heavy water is occurring. The transfer will require the submittal of a Part A modification to SCDHEC.

3.1A.3.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

The operational cost of this facility is variable. Its cost is based on the level of contamination that must be removed by the ion exchange probe. The probe itself has an operational capacity of one drum or 55 gallons of heavy water processed by ion exchange per day. It may be necessary in time to replace resin. The D-Area Heavy Water regeneration facility has done only a small amount of recycling activity through ion exchange. As a result, estimates are preliminary. Cost of treating the Mercury Contaminated Heavy Water would come from the operating budget of the waste generator, Reactor Restart Division.

The estimated cost to treat this waste stream is less than \$100 thousand.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.1A.4 Nickel Plating Line Solution

3.1A.4.1 GENERAL INFORMATION

Waste Stream Number: SR-W039

The preferred treatment option for M-Area Nickel Plating Line Solution is Vitrification in the M-Area Vendor Treatment Process.

Background Information:

This waste is plating line solution generated by the shut down of the M-Area process line.

Volume

- Current volume through 09/30/93 is 5.0 m³.
- No future waste generation expected because the manufacturing process which generated this waste is no longer operational.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D002A (corrosive), D008A (TCLP Pb) wastewater

LDR Treatment Standard

- D002A = specified technology – Deactivation
- D008A concentration based standard – 5.0 mg/l
- California list = render non-liquid

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high because EP toxicity test was run.
- No TCLP was performed.
- Primary contaminant Ni with trace amounts of Pb.

Radiological Characterization

- Total activity is 6.56×10^{-5} Ci
- Alpha emitters are U²³⁴, U²³⁵, and U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

3.1A.4.2 TECHNOLOGY AND CAPACITY NEEDS

The specified technology for corrosive waste streams is deactivation to remove the hazardous characteristic. Deactivation for corrosive materials requires pH adjustment to neutralize the waste to an acceptable pH range between 2.0 and 12.5 pH units. The concentration based standard for D008, lead, is 5.0 mg/l. This waste stream is also a California list waste due to high nickel content. Treatment by vitrification will render the waste non-liquid thereby satisfying the California list restriction.

This waste stream is one of the six original streams which served as a basis for the M-Area Vendor Treatment Process design. The total volume of these wastes projected to need treatment is approximately 2.8 million kg. This waste type is not anticipated to be generated in the future since the source of the waste, M-Area Plating operations, has been shut down and is not expected to operate again at SRS. The vitrification facility will be designed to treat waste at a rate of 5000 kg/day of glass.

3.1A.4.3 TREATMENT OPTION INFORMATION

Treatability studies performed on the M-Area Sludge by the SRTC determined that either a cementitious matrix or a vitrification process was capable of producing a final waste form capable of meeting the LDR requirements. Requests for bids were made to vendors capable of treating the waste stream using either method. It was determined that the vitrification process was the most cost effective method and that it would create the most stable waste form with the least volume generated.

Facility Status

The M-Area Vendor Treatment Process is completely designed, with a contract awarded to the vendor for treating M-Area plating sludges and solutions. However, the vendor contract would need to be modified to include other additional wastes identified by the DSTP in the cost, storage, and other pertinent areas affected by the increase of waste volume.

Technology

Treatability demonstrations on the originally identified M-Area wastes have proven the technology to be reliable and able to treat the physical waste matrix types identified to meet LDR treatment standards.

Regulatory Status

SRS intends to permit the treatment of waste in the M-Area Vendor Treatment Process by an industrial wastewater permit. The vitrification facility is an extension of the M-Area Liquid Effluent Treatment Facility and a part of that treatment train is permitted as an industrial wastewater facility. Preliminary response from SCDHEC has indicated agreement that permitting the vendor treatment facility under a wastewater permit is possible and acceptable. Under the requirements of the Land Disposal Restriction Federal Facility Compliance Agreement, SRS submitted permit applications to SCDHEC for the M-Area Vendor Treatment Process facility on June 24, 1994.

Major permits required are:

- a. Modification to the M-Area Industrial Wastewater Treatment Permit
- b. Interim Status Closure of the M-Area PWIT/SF
- c. Container Storage Permit (either expansion under SRS Part A Interim Status, or a Part B Permit)
- d. SCDHEC Air Quality Permit for process emissions

The NEPA documentation has been prepared and an EA conducted. A FONSI was issued on August 1, 1994.

Preparation for Operation

All required permit applications for treating the M-Area plating sludges and solutions were submitted on June 24, 1994 for the original scope (six streams). Since the major permit is a modification to the existing wastewater treatment permit, approval is anticipated within 6 months (12/94). Treatment of the M-Area LDR wastes (i.e., preparation of the initial homogeneous feed batch for the stabilization unit) is targeted to begin with 225 days of permit approvals. Delay in approval of any of the required permits could delay the startup of the treatment process. An additional permit modification to increase the capacity and name the other waste streams will need to be done as soon as possible in order not to impact the M-Area schedule for the plating sludges and solutions.

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3.1A.4.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

This waste stream is one of six design basis waste streams intended to be treated by the M-Area Vendor Treatment Process. The six waste streams are SR-W004, SR-W005, SR-W029, SR-W037, SR-W038, and SR-W039. The estimated cost for the M-Area Vendor Treatment Process is between \$18 million and \$24 million.

The current SRS five year plan includes funding for M-Area Vendor Treatment Process at the "Target Level" only for Fiscal Years 1995 and 1996. The Annual Operating Plan has sufficient funds to support M-Area activities for Fiscal Year 1994.

Uncertainty Issues

SRS will request SCDHEC to approve the wastewater permit application and other associated permits in treating this waste. Budget and scheduling uncertainties may arise regarding regulatory activities until final approval and permitting is received.

3.1A.5 Consolidated Incinerator (CIF) Blowdown

3.1A.5.1 GENERAL INFORMATION

Waste Stream Number: SR-W047

The preferred treatment option for the Consolidated Incinerator (CIF) Blowdown waste stream is stabilization in the Consolidated Incinerator Ashcrete Facility.

Background Information:

A future waste stream composed of scrubber blowdown water (wastewater) from the Consolidated Incineration Facility (CIF) offgas emission control system.

Volume

- Expected 1993-1997 volume generation is 400 m³.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- Numerous waste codes from feed waste/derived from rule. Blowdown waste stream will contain all of the listed waste codes that are fed into the CIF. Consult the RCRA Part B Permit Application for a complete listing.

LDR Treatment Standard

- Standards are too numerous to list. See the standards in 40 CFR 268.41-43.

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium based on the fact this is a future waste stream and no analysis available.

Radiological Characterization

- Tritium present, alpha and beta/gamma emitters
- Activity level is <10 nCi/g
- Waste is contact handled.
- Mixed low-level waste

3.1A.5.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. The CIF Blowdown is the scrubber water from the CIF air pollution control equipment. Analysis of this waste stream should show contaminants of a similar nature to that of the CIF Ash with much the same treatment needs. As a result, treatment of this waste by stabilization should meet the LDR requirements for this waste stream.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. Currently, the ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown

based on the permitted solid and liquid feed rates granted by SCDHEC. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.1A.5.3 TREATMENT OPTION INFORMATION

This treatment option was selected as the preferred option even though it did not have the highest score from the In-depth Option Analysis (IDOA) Process. The SRS technical analysis team determined through engineering assessment that the identified preferred treatment option represented the most feasible treatment alternative for the waste stream at this time.

Option Support Justification – IDOA Performed

- Treatment by the preferred option will produce a well accepted waste form which has been repeatedly demonstrated to meet LDR requirements.
- No secondary waste generated. Waste form ready for disposal.
- Treatment process is a well understood technology.
- Preferred option utilizes existing, onsite facility. Requires no extra equipment or additional personnel. Minimizes worker exposure and reduces waste handling as compared with other options.

Facility Status

The CIF is completely designed and as of June 30, 1994, construction is 80% complete. The facility is fully funded and is anticipated to have construction complete December 31, 1995. The start date to treat mixed waste is anticipated to be second quarter FY96. Construction of the CIF is on schedule.

The CIF Blowdown stream will be generated during the operation of the incinerator and will be placed in 55 gallon (0.2 m³) drums to be stabilized in the Ashcrete portion of the facility using cement stabilization.

Regulatory Status

Since the treatment of CIF blowdown in the Ashcrete portion of the facility was not a part of the original Part B Permit Application submittal for the CIF, a modification of the CIF RCRA Part B Permit was necessary and submitted to allow for this treatment option. The treatment of the CIF Blowdown was addressed in Revision Two of the RCRA Part B Renewal Application for the CIF submitted June 17, 1994.

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B Permit effective November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date is December 10, 1992. The NESHAP Construction Permit for radionuclides was received on June 14, 1989; the NESHAP Exemption for Benzene Emissions was received on August 18, 1989. Under the NEPA process, an Environmental Assessment (EA) was prepared for the CIF and a 60-day public comment period was held for the proposed Finding of No Significant Impact (FONSI). The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

3.1A.5.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

The estimated cost to treat this waste stream is between \$23 million and \$31 million.

Uncertainty Issues

SRS has requested SCDHEC approval of the RCRA Part B Permit modification to treat CIF Blowdown in the Ashcrete portion of the facility for the proposed option in treating this waste. Budget and scheduling uncertainties may arise regarding regulatory activities until final approval and permitting is received.

Applicability of additional evaluation under NEPA creates uncertainty related to budget and schedule for this treatment option.

No technical uncertainties were identified for either waste treatment or radiological concerns.

3.1A.6 Uranium/Chromium Solution

3.1A.6.1 GENERAL INFORMATION

Waste Stream Number: SR-W031

The preferred treatment option for the Uranium/Chromium Solution waste stream is Vitrification in the M-Area Vendor Treatment Process.

Background Information:

This waste stream is a one time waste generation. A portion of the waste stream was generated by the Naval Fuels laboratory to assay uranium content by scintillation/Davis Gray procedure. It is a 2% solids solution in a glass container overpacked in a 55 gallon drum. Another portion of the waste stream is sludge which accumulated in stainless steel air ducts in the Naval Fuels Facility where uranium in the sludge caused a reaction with the stainless steel, liberating leachable chromium. This waste sludge is in two lined 55-gallon drums.

Volume

- Current volume through 09/30/93 is 0.6 m³.
- No future waste generation expected because the manufacturing process (Naval Fuels) which generated this waste, is no longer operational.

Waste Stream Composition

- Aqueous Liquid
- Inorganic Sludge/Particulate

Waste Code

- D007A – (TCLP Cr)

LDR Treatment Standard

- Concentration based standard = 5.0 mg/l

Waste Characterization

- Process knowledge and sampling and analysis used to characterize the waste.
- Process knowledge was used to characterize laboratory waste stream via mass balance calculation.
- Confidence level is high because analysis was performed on the duct cleaning waste from Naval Fuels.

Radiological Characterization

- Total activity is 0.4 nCi/g.
- Alpha emitter is U²³⁵.
- Waste is contact handled.
- Mixed low-level waste

3.1A.6.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. The treatment standard for chromium contaminated wastewater is 5.0 mg/l total composition, and 5.0 mg/l by TCLP test for the non-wastewater.

The M-Area Vendor Treatment Process will be designed to treat waste at a rate of 5,000 kg/day of glass.

Since this waste stream was not generated in M-Area, it will be necessary to request a permit modification in order to treat this waste stream in the M-Area Vendor Treatment Process. As part of a future permit application, it may be necessary to perform a treatability study on the waste streams as evidence of the acceptability of treatment in the vitrification process.

Also, since this waste stream is not on the original list for treatment in the M-Area Vendor Treatment Process, it will be necessary to include an evaluation of the uranium/chromium solution waste stream in the NEPA documentation. The DSTP will provide information to the Waste Management EIS which should supply the required NEPA documentation to evaluate this waste stream. This waste stream has been given a preliminary analysis by the M-Area project team and identified as being able to feed into the vitrification unit without modification to its construction or configuration.

3.1A.6.3 TREATMENT OPTION INFORMATION

Treatability studies performed on the M-Area waste streams by the Savannah River Technology Center determined that either a cementitious matrix or a vitrification process was capable of producing a final waste form which would meet the LDR requirements. Requests for bids were made to vendors capable of treating the waste stream using either method. It was determined that the vitrification process would create the most stable waste form, with the least volume and was the most cost effective.

In addition to the volume of this waste stream, there are six original waste streams at M-Area which have vitrification in the M-Area Vendor Treatment Process as the preferred treatment option. The total volume of these wastes projected to need treatment is approximately 2.8 million kg. This waste type is not anticipated to be generated in the future since the source of the waste, Naval Fuels has been shut down and is not expected to operate again.

It has been the intention of SRS to permit the treatment of waste in the M-Area Vendor Treatment Process by an industrial wastewater permit since the vitrification facility is an extension of the M-Area Liquid Effluent Treatment Facility and therefore a part of that treatment train. The M-Area Liquid Effluent Treatment Facility is permitted as an industrial wastewater facility. Preliminary response from SCDHEC indicated agreement that permitting the vendor treatment facility under a wastewater permit is possible and acceptable, and a wastewater permit application was submitted on June 24, 1994.

Option Support Justification – IDOA Performed

- Treatment option produces a very stable waste form that requires no additional treatment for disposal.
- Treatment results in extensive waste volume reduction of greater than 5:1.
- Treatment option utilizes an existing onsite treatment facility.

Facility Status

The M-Area Vendor Treatment Process is completely designed, with a contract awarded to the vendor for treating M-Area plating sludges and solutions. However, the vendor contract would need to be modified to include this as well as the other additional wastes identified by the DSTP in the cost, storage, and other pertinent areas affected by the increase of waste volume.

Technology

Treatability demonstrations on the originally identified M-Area wastes have proven the technology to be reliable and able to treat the physical waste matrix types identified to meet LDR treatment standards. Treatability demonstrations for this waste stream may or may not have to be conducted, depending on its similarity to the M-Area plating sludges and solutions.

Regulatory Status

SRS intends to permit the treatment of waste in the M-Area Vendor Treatment Process by an industrial wastewater permit. The vitrification facility is an extension of the M-Area Liquid Effluent Treatment Facility and a part of that treatment train is permitted as an industrial wastewater facility. Preliminary response from SCDHEC has indicated agreement that permitting the vendor treatment facility under a wastewater permit is possible and acceptable. Under the requirements of the Land Disposal Restriction Federal Facility Compliance Agreement, SRS submitted permit applications to SCDHEC for the M-Area Vendor Treatment Process facility on June 24, 1994.

Major permits required are:

- a. Modification to the M-Area Industrial Wastewater Treatment Permit
- b. Interim Status Closure of the M-Area PWIT/SF
- c. Container Storage Permit (either expansion under SRS Part A Interim Status, or a Part B Permit)
- d. SCDHEC Air Quality Permit for Process Emissions

The NEPA documentation has been prepared and an EA conducted. A FONSI for the M-Area Vendor Treatment Process was issued on August 1, 1994.

Preparation for Operation

All required permit applications for treating the M-Area plating sludges and solutions were submitted on June 24, 1994 for the original scope (six streams). Since the major permit is a modification to the existing wastewater treatment permit, approval is anticipated within 6 months (12/94). Treatment of the M-Area LDR wastes (i.e., preparation of the initial homogeneous feed batch for the stabilization unit) is targeted to begin with 225 days of permit approvals. Delay in approval of any of the required permits could delay the startup of the treatment process. An additional permit modification to increase the capacity and name the other waste streams will need to be done as soon as possible in order not to impact the M-Area schedule for the plating sludges and solutions.

3.1A.6.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Negotiations will need to be reopened with the vendor to address the additional waste streams identified by the DSTP. Funding for treating the M-Area wastes via vitrification has already been budgeted.

The estimated cost to treat this waste stream is between \$400 and \$900 thousand.

Uncertainty Issues

SRS is requesting SCDHEC to approve the wastewater permit application and other associated permits in treating this waste. Budget and scheduling uncertainties may arise if this permit is not approved.

3.1A.7 Aqueous Mercury and Lead

3.1A.7.1 GENERAL INFORMATION

Waste Stream Number: SR-W041A

The preferred option for the Aqueous Mercury and Lead waste stream is treatment in the F- and H-Effluent Treatment Facility (ETF) using Ion Exchange.

Background Information:

In the MWIR, SR-W041 is reported as a single waste stream due to the fact that it is all in one drum. However, when evaluation of the waste streams for treatment options began, it was recognized that the stream should be divided into its three distinct components. Thus, the stream numbers have been changed with the addition of an A, B, or C suffix. This portion of the waste stream consists of one 6-liter and one 2-liter bottle of aqueous mercury and one 4-liter bottle of aqueous lead. This waste was generated from analytical support for the Naval Fuels Development Facility (779-A).

Volume

- Current volume through 09/30/93 is 0.09 m³.
- No future waste generation is expected because waste was generated from a one time cleanout of a laboratory, which is no longer operational.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D008A (TCLP Pb) wastewater
- D009C (high Hg contains inorganics) wastewater

LDR Treatment Standard

- D008A = concentration based standard, 5.0 mg/l
- D009C = specified technology – RMERC

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Sampling and analysis for mercury is available because confidence level is high.

Radiological Characterization

- Sampling and analysis indicates the average activity level is 2.9 nCi/g.
- Beta/gamma emitter, alpha emitter, U²³⁸, tritium present.
- Waste is contact handled.
- Mixed low-level waste

3.1A.7.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. The introduction of the Aqueous Mercury and Lead waste stream to the F- and H- Effluent Treatment Facility (ETF) will require approval from SCDHEC. Since treatment of this waste stream does not require any change in the treatment process, no permit modification is required. However, for approval to add this waste stream to F and H ETF, SRS must demonstrate through a treatability study that it is possible to treat the waste in that facility. The preferred treatment option is a wastewater treatment facility. The discharge from this wastewater treatment facility is covered by an NPDES permit and must meet those requirements rather than LDR requirements. However, any wastewater sludges that are determined to be characteristically hazardous must be treated per LDR standards prior to disposal. It is not anticipated that treatment of this waste will generate characteristically hazardous sludges.

The concentration based standard for lead is 5.0 mg/l based on total composition. The high mercury is in solution, indicating a specified technology of RMERC. Because this is a wastewater with high mercury, SRS is asking SCDHEC for regulatory discretion to treat it using ion exchange. Ion exchange in the F and H ETF would provide a treated waste stream that would comply with the requirements in the ETF permit and allows this waste stream to be treated at an existing facility with little or no additional modification.

This small volume, one time generation waste stream can be assimilated into the F and H ETF treatment process without an impact on the capacity of the facility or without modification of the treatment system to accept the waste.

3.1A.7.3 TREATMENT OPTION INFORMATION

Option Support Justification – IDOA Performed

- Records indicate very successful treatment of similar waste streams by this treatment facility. Treatment system represents proven technology.
- Significant waste volume reduction by treatment with this option. Volume reduction estimated at 20:1 results in minimal secondary waste for disposal.
- Treatment option is an existing, onsite facility. Addition of this waste stream requires no extra equipment or personnel.
- Permit requirements for this waste stream treatment are simple and straightforward.

Facility Status

The F and H ETF is fully operational.

Technology

Ion exchange to remove the ionic mercury and lead is a proven technology and one of the current treatments available at this wastewater treatment facility.

Regulatory Status

This facility is operating under an NPDES permit issued to the SRS on July 1, 1988. A request for permission to treat this waste stream under a one-time only petition must be submitted to the SCDHEC. In addition, SCDHEC is requested to grant regulatory discretion in not treating the mercury waste to the specified technology but instead performing an alternate treatment.

Preparation for Operation

No physical preparation or modification would be required to treat this waste stream since the site will seek permission to introduce the waste stream into the ETF through the ETF laboratory drain system (ETF is hardpiped to F- and H-Area Outside Facilities and since this

waste stream is only 12 liters in volume, the laboratory seems appropriate for this small volume to get to the ETF).

3.1A.7.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

There is no significant budget impact from utilization of the F and H ETF to treat this waste stream. Treatment cost comes from the operating budget.

The estimated cost to treat this waste stream is less than \$450 thousand.

Uncertainty Issues

SRS is requesting SCDHEC/EPA to approve the proposed regulatory discretion in treating this waste for mercury by an alternate treatment (ion exchange) rather than the specified technology RMERC due to the site not having a roast and retort unit, but having an ion exchange unit which can treat the waste. Budget and scheduling uncertainties may arise without regulatory relief.

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Section 3.1B Cemented Solids

3.1B.1 M-Area Sludge Treatability Samples

3.1B.1.1 GENERAL INFORMATION

Waste Stream Number: **SR-W029**

The preferred treatment option for M-Area Sludge Treatability Samples is stabilization by Vitrification in the M-Area Vendor Treatment Process.

Background Information:

This waste stream consists of stabilized sludge samples from the Process Waste Interim Treatment/Storage Facility of M-Area that has been stabilized with cement, cement/fly ash/blast furnace slag, or by vitrification. Samples are generated during waste treatability studies to determine the formulation of the stabilized waste form.

Volume

- Current volume through 09/30/93 is 1.0 m³.
- No future waste generation expected because M-Area Vendor Treatment Process treatability studies completed; additional test samples may be generated.

Waste Stream Composition

- Cemented Solids/Vitrified Solids

Waste Code

- F006 (metal plating waste, without cyanide)
- Metal contaminants = Pb, Cr, Ni

LDR Treatment Standard

- Concentration based standards – 0.066-5.2 mg/l

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based on total constituent analysis performed on the sludge and knowledge that the process generates a listed waste.
- The primary contaminant is Ni with other metals present being Pb and Cr.

Radiological Characterization

- Total activity is 0.0176 Ci.
- Alpha emitters are U²³⁴, U²³⁵, and U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

3.1B.1.2 TECHNOLOGY AND CAPACITY NEEDS

There are no specified technologies for this waste stream. The treatment standards for the indicated metals present in F006 waste code material are nickel = 0.32 mg/l, lead = 0.51 mg/l and chromium = 5.2 mg/l. SRS has never used cyanides, cadmium, silver, lead, or chromium in its metal plating activities. Cyanide, silver, and cadmium have not been detected while lead and chromium have been detected at about 100-2000 mg/kg (total constituent analysis).

This waste stream is one of the six original streams which served as a basis for the M-Area Vendor Treatment Process design. The total volume of these wastes projected to need treatment is approximately 2.8 million kg. This waste type is not anticipated to be generated in the future since the source of the waste, M-Area Plating operations, has been shut down

and is not expected to operate again at SRS. The vitrification facility will be designed to treat waste at a rate of 5000 kg/day of glass.

3.1B.1.3 TREATMENT OPTION INFORMATION

Treatability studies performed on the M-Area Sludge by the SRTC determined that either a cementitious matrix or a vitrification process was capable of producing a final waste form capable of meeting the LDR requirements. Requests for bids were made to vendors capable of treating the waste stream using either method. It was determined that the vitrification process was the most cost effective method and that it would create the most stable waste form with the least volume generated.

Facility Status

The M-Area Vendor Treatment Process is completely designed, with a contract awarded to the vendor for treating M-Area plating sludges and solutions. However, the vendor contract would need to be modified to include other additional wastes identified by the DSTP in the cost, storage, and other pertinent areas affected by the increase of waste volume.

Technology

Treatability demonstrations on the originally identified M-Area wastes have proven the technology to be reliable and able to treat the physical waste matrix types identified to meet LDR treatment standards.

Regulatory Status

SRS intends to permit the treatment of waste in the M-Area Vendor Treatment Process by an industrial wastewater permit. The vitrification facility is an extension of the M-Area Liquid Effluent Treatment Facility and a part of that treatment train is permitted as an industrial wastewater facility. Preliminary response from SCDHEC has indicated agreement that permitting the vendor treatment facility under a wastewater permit is possible and acceptable. Under the requirements of the Land Disposal Restriction Federal Facility Compliance Agreement, SRS submitted permit applications to SCDHEC for the M-Area Vendor Treatment Process facility on June 24, 1994.

Major permits required are:

- a. Modification to the M-Area Industrial Wastewater Treatment Permit
- b. Interim Status Closure of the M-Area PWIT/SF
- c. Container Storage Permit (either expansion under SRS Part A Interim Status, or a Part B Permit)
- d. SCDHEC Air Quality Permit for process emissions

The NEPA documentation has been prepared and an EA conducted. A FONSI was issued on August 1, 1994.

Preparation for Operation

All required permit applications for treating the M-Area plating sludges and solutions were submitted on June 24, 1994 for the original scope (six streams). Since the major permit is a modification to the existing wastewater treatment permit, approval is anticipated within 6 months (12/94). Treatment of the M-Area LDR wastes (i.e., preparation of the initial homogeneous feed batch for the stabilization unit) is targeted to begin with 225 days of permit approvals. Delay in approval of any of the required permits could delay the startup of the treatment process. An additional permit modification to increase the capacity and name

the other waste streams will need to be done as soon as possible in order not to impact the M-Area schedule for the plating sludges and solutions.

3.1B.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

This waste stream is one of six design basis waste streams intended to be treated by the M-Area Vendor Treatment Process. The six waste streams are SR-W004, SR-W005, SR-W029, SR-W037, SR-W038, and SR-W039. The estimated cost for the M-Area Vendor Treatment Process is between \$18 million and \$24 million.

The current SRS five year plan includes funding for M-Area Vendor Treatment Process at the "Target Level" only for Fiscal Years 1995 and 1996. The Annual Operating Plan has sufficient funds to support M-Area activities for Fiscal Year 1994.

Uncertainty Issues

SRS will request SCDHEC to approve the wastewater permit application and other associated permits in treating this waste. Budget and scheduling uncertainties may arise regarding regulatory activities until final approval and permitting is received.

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Section 3.1C Lead

3.1C.1 LLW Lead (Uncombined Elemental Lead)

3.1C.1.1 GENERAL INFORMATION

Waste Stream Number: **SR-W013A**

The preferred treatment option for the LLW Lead (Uncombined Elemental Lead) waste stream is Decontamination in an offsite vendor treatment facility.

Background Information:

In the Mixed Waste Inventory Report (MWIR), SR-W013 is reported as a single waste stream. However, when evaluation of the waste stream for treatment options began, it was recognized that the stream should be divided into its two distinct components. Thus, the stream numbers have been changed with the additions of an A or B suffix. This portion of the waste (approximately 50% of the waste stream volume) consists of elemental lead which can be decontaminated and reused.

Volume

- Current volume through 09/30/93 is 86.4 m³.
- Expected 1993-1997 volume will be 30 m³.

Waste Stream Composition

- Elemental lead

Waste Code

- D008C – (elemental Pb)

LDR Treatment Standard

- D008C = specified technology – macroencapsulation for lead

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based on the fact that waste is easily identified as containing lead.

Radiological Characterization

- Transuranic contaminants from Pu²³⁸, Pu²³⁹, Beta/Gamma Emitters of Cs¹³⁷, Sr⁹⁰, and U²³⁵.
- Waste is contact handled.
- Mixed low-level waste

3.1C.1.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. The lead waste code has a specified technology by which it must be treated to meet the LDR standard, if discarded. Most of the mixed waste lead in this waste stream is elemental lead which has been used for shielding or in other ways that has caused it to become radioactively contaminated. The specified technology for this waste code is Macroencapsulation with a surface coating or jacket of inert material. Waste minimization philosophy would dictate that a thorough investigation be made into recycling as much of this lead waste as possible.

Vendor workoff rates will be determined in the procurement process.

3.1C.1.3 TREATMENT OPTION INFORMATION

A significant portion of the waste stream is radioactively contaminated on the surface only. Technologies are available to remove layers of lead using an acid bath. This removes the surface layer leaving uncontaminated lead suitable for reuse or recycle. The radioactively contaminated waste lead is then significantly reduced in volume and can be treated in a more efficient manner.

The recycling activities are anticipated to be performed on this mixed waste stream by a vendor. Therefore, no treatment permits are required on the part of SRS. Since the material to be recycled has been declared a waste, there will be requirements for the proper labeling

and transportation of the waste to the vendor for recycling. Waste generated from the recycling activities must be disposed in accordance with the LDR regulations.

Option Support Justification – IDOA Performed

- Treatment option highly supportive of waste minimization and resource recovery.
- Very great volume reduction. Only material not capable of being decontaminated returned to SRS. Remainder can be reused.
- Treatment option utilizes offsite vendor treatment at existing facility. Decontamination process proven technology.
- No permit development required by SRS. Fast treatment turn around time.

Facility Status

A determination will be needed on the method of containerizing lead for shipment to the vendor, frequency of shipments, logistics of returning decontaminated lead to SRS and waste form of unusable lead generated from recycling.

Technology

Lead decontamination using an acid bath to remove the surface activated lead is a proven technology.

3.1C.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

SRS is negotiating a contract with the vendor to initiate decontamination of this lead waste stream. The treatment option represents a proposal submitted by a vendor. Before recycling activities can begin, contract arrangements must be made which include budget approval.

The estimated cost to treat this waste stream is less than \$650 thousand.

Uncertainty Issues

This technology is standard for decontaminating lead for re-use. However, the waste's radiation level in relation to the vendor treatment facility's WAC has not been fully analyzed.

Transportation of this waste stream to the offsite vendor for treatment raises questions not yet evaluated regarding approval by affected state agencies (e.g., receiving state and corridor states) and their stakeholders .

There is some uncertainty with an offsite option selection until completion of negotiations, administrative procedures, and verification of appropriate treatment are finalized. Similarly, waste residues returned to SRS after treatment is completed must have the assurance of authenticity (i.e., waste treated is that of SRS only and not treated waste from another generator).

3.1C.2 LLW Lead (Combined Lead)

3.1C.2.1 GENERAL INFORMATION

Waste Stream Number: SR-W013B

The preferred option for the LLW Lead (Combined Lead) waste stream is Macroencapsulation in vinyl polymer encapsulation onsite by vendor treatment.

Background Information:

In the MWIR, SR-W013 is reported as a single waste stream. However, when evaluation of the waste stream for treatment options began, it was recognized that the stream should be divided into its two distinct components. Thus, the stream numbers have been changed with the addition of an A or B suffix. This portion, SR-W013B, consists of lead in the form of lead lined gloves, aprons, and mercury vapor lights, discarded equipment containing lead and other lead materials.

Volume

- Current volume through 09/30/93 is 86.4 m³.
- Expected 1993-1997 volume will be 30 m³.

Waste Stream Composition

- Elemental lead
- Non-elemental lead
- Lead acid batteries from radiological areas (less than 1% of the waste stream)

Waste Code

- D008B – (lead acid batteries)
- D008C – (elemental Pb)

LDR Treatment Standard

- D008B = specified technology – thermal recovery of lead in secondary lead smelters
- D008C = specified technology – macroencapsulation for lead

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based on the fact that waste is easily identified as containing lead.

Radiological Characterization

- Transuranic contaminants from Pu²³⁸, Pu²³⁹, beta/gamma Emitters of Cs¹³⁷, Sr⁹⁰, and U²³⁵.
- Waste is contact handled.
- Mixed low-level waste

3.1C.2.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. The lead in this waste stream has been used for protective purposes. However, this lead waste is in the form of lead lined gloves and aprons in which the lead is combined with other materials. The lead waste code still has the same specified technology by which it must be treated to meet the LDR standard as if the lead were in an uncombined state. The specified technology for this waste code is Macroencapsulation with a surface coating or jacket of inert materials. Less than 1% of the waste stream's volume is drained lead batteries from RMMAs. The specified technology for this portion of the waste stream is recovery of lead. Due to potential contamination of the batteries, it is uncertain that recovery of lead from this waste stream is a viable option. SRS is seeking approval from SCDHEC by the DSTP process to macroencapsulate this portion of the waste stream.

The preferred option is to treat the waste in compliance with the LDR treatment standard through the utilization of macroencapsulation and to obtain regulatory discretion from SCDHEC to macroencapsulate the small quantity of drained lead acid batteries.

3.1C.2.3 TREATMENT OPTION INFORMATION

A permit will be needed for the treatment of this waste stream. Whether the acquisition of the permit is the responsibility of the Vendor or SRS must be determined and will depend on the manner in which the Macroencapsulation treatment is done and the contractual arrangement. It is possible the vendor already may have the required permits.

The location for vendor treatment is to be determined.

3.1C.2.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

The estimated cost to treat this waste stream is between \$10 million and \$24 million.

Uncertainty Issues

SRS will request SCDHEC approval for the proposed option to macroencapsulate the batteries portion of this waste stream. Budget and scheduling uncertainties may arise regarding regulatory activities until final approval and permitting is received.

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Section 3.1D Heterogeneous Debris

3.1D.1 Spent Filter Cartridges

3.1D.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W051

The preferred treatment option for the Spent Filter Cartridges waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

The waste consists of a fibrous media filter in a plastic frame used in Naval Fuels to remove particulates in the process flow stream. Mercury salt and particles of depleted uranium are the expected impurities.

Volume

- Current volume through 09/30/93 is 0.6 m³.
- No future waste generation expected because the Naval Fuels process which generated this waste is no longer operational.

Waste Stream Composition

- Heterogeneous debris

Waste Code

- D009A (low TCLP mercury)

LDR Treatment Standard

- Concentration based standard = 0.2 mg/l
- Alternative debris technology may be applied

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level high based upon knowledge that mercury is present. No direct analytical data is available, concentration of mercury is unknown.

Radiological Characterization

- Total activity is 6.6×10^{-4} Ci/kg
- Alpha emitter with U²³⁵, U²³⁸ present.
- Waste is contact handled.
- Mixed low-level waste

3.1D.1.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. This waste stream qualifies as debris. It can be treated by one of the seventeen alternative debris technologies or be treated to the concentration based treatment standard of 0.2 mg/l mercury TCLP. This material qualifies as debris under the land disposal regulations because its particle size is larger than 60 mm and it is a manufactured material. One debris treatment method available for mercury contaminated waste is Thermal Destruction, the addition of waste to an incinerator, boiler, or industrial furnace which complies with applicable RCRA regulations.

The preferred treatment option for this waste stream utilizes the debris treatment alternative of thermal destruction by means of incineration. Treatment of the waste stream in this manner complies with land disposal requirements for the proper management of this waste code. This choice offers the most efficient treatment method for the waste stream and utilizes existing, onsite facilities.

This is a small volume, one time generation from the shut down of the Naval Fuels facility. It should impose minimum capacity impact on the CIF. It will require repackaging in preparation to feed to the incinerator, but should require no special handling requirements as compared to other waste streams.

The CIF will have spare capacity to treat other SRS wastes in addition to the design basis waste streams. SRS mission changes have reduced the expected quantity of the design basis waste feeds.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.1D.1.3 TREATMENT OPTION INFORMATION

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, initial incineration provides organic contaminant destruction and proper volume reduction in preparation for stabilization of the metals in the waste stream.

SRS committed to reassess the evaluation of waste streams for which incineration originally had been determined to be the best and most practical treatment technology. The CIF Mission Need and Design Capacity Review (7/7/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 7/29/93) re-evaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to generally re-examine the appropriateness of each Functional Performance Requirement (FPR) design basis waste group. The FPR is an initial engineering design document that defines the scope of the design project and serves as a baseline for subsequent project design work. The review included additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to FPR nonradioactive waste groups that were addressed in the FPR. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA LDR requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Option Support Justification – IDOA Performed

- Incineration/Stabilization treatment train represents demonstrated technology which is known to be capable of meeting LDR treatment requirement for the mercury waste listed for this waste stream.
- Treatment process results in significant volume reduction for disposal after treatment (filter is a composite of PVC and filter media).
- Treatment option is an existing, onsite facility. No extra equipment or personnel required for waste processing.
- Utilization of existing treatment facility may minimize permit requirements resulting in faster treatment turn around time.

Facility Status

The CIF is completely designed and as of June 30, 1994, construction is 80% complete. The facility is fully funded and is anticipated to have construction complete December 31, 1995. Start date to treat mixed waste is anticipated to be February 1996.

Technology

Treatability demonstrations for this waste stream may or may not have to be conducted, depending on its similarity to the wastes the CIF was designed to handle.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an Environmental Assessment was prepared for the CIF and a 60-day public comment period was held for the proposed Finding of No Significant Impact (FONSI). The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

It is believed that a RCRA Part B Permit modification is not necessary in order to incinerate this waste at the CIF because the waste codes listed for this waste stream already are in the existing RCRA Part B Permit Application.

Preparation for Operation

Construction is on schedule for the CIF. However, a pretreatment step to repackage the waste to meet the CIF Waste Acceptance Criteria is required. Further detail on where this operation will be accomplished is being analyzed.

3.1D.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

The estimated cost to treat this waste stream is less than \$500 thousand.

Uncertainty Issues

This technology has been determined suitable for treating the hazardous constituent of the waste stream. However, the character of the waste in relation to the CIF WAC has not been fully analyzed.

Section 3.1E Inorganic Debris

3.1E.1 In-Tank Precipitation Filters

3.1E.1.1 GENERAL INFORMATION

Waste Stream Number: **SR-W020**

The preferred treatment option for In-Tank Precipitation Filters is in-situ treatment using an Acid Wash technology followed by placement in an engineered stainless steel containment box in compliance with an approved treatability variance.

Background Information:

A future debris waste stream generated from the In-Tank Precipitation (ITP) process which treats and separates radioactive salt solution in preparation for processing in the Defense Waste Processing Facility (DWPF) and Saltstone Facility. The salt solution is treated with tetraphenyl borate and sodium titanate to precipitate radioactive cesium, strontium, and plutonium. This precipitate is filtered by the ITP Filters and is expected to eventually foul the filters, requiring their replacement, treatment, and disposal. The filter consists of 144 sintered metal tubes. Each tube is 10 feet long and sits in an assembly measuring 14 feet long by 1.5 feet in diameter.

Volume

- Expected 1993-1997 volume generation is 16.3 m³.

Waste Stream Composition

- Inorganic Debris

Waste Code

- D009A (TCLP Hg), D018 (benzene)

LDR Treatment Standard

- D009A = concentration based standard = 0.2 mg/l
- D018 = no treatment standard yet developed by EPA
- Alternate debris technology may be applied

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium since this waste stream has not yet been generated.
- Typical expected concentration is 286g Hg, 5000g benzene per filter. This is estimated by calculation.

Radiological Characterization

- Total activity is estimated to be 3400 Ci/filter.
- Beta/gamma emitters are Cs¹³⁷, Cs¹³⁴, Sr⁹⁰, Tc⁹⁹, Ru¹⁰⁶, Sb¹²⁵, and I¹²⁹.
- Waste is remote handled.
- Mixed low-level waste

3.1E.1.2 TECHNOLOGY AND CAPACITY NEEDS

There is a concentration based treatment standard for this waste stream of 0.2 mg/l for mercury. This waste also qualifies as debris and can be treated by one of 17 debris technologies. However, because of the radiological nature of the filter in its failed state, meeting LDR requirements was not feasible. As a result, SRS submitted a treatability variance request for this waste stream.

Since the ITP Facility is not yet operational, failure rate of the filters is not known. However, it has been estimated that one filter may fail every two years in the course of routine operation. The filters are highly radioactive and will require remote handling to protect against worker exposure to radiation.

3.1E.1.3 TREATMENT OPTION INFORMATION

The EPA approved treatment process for the ITP wastes includes: 1) acid leaching prior to disposal, to treat the mercury and benzene, and 2) placement in an engineered box to protect against radiation exposure and contain the hazardous constituents. The box has been designed to include filters to absorb benzene and mercury vapors, in addition to a vent design to keep benzene vapors below the lower explosive limit. A treatability variance request to establish a treatment standard specific to this waste was filed with the EPA Region IV in January 1992. SRS received final approval for the variance on October 1, 1993.

3.1E.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

The ITP Filters are a future waste stream. The frequency of generation of the filters as waste is not certain. However, one engineered container has been constructed for handling the first failed filter.

Budget Status

A determination is being made concerning the operational cost of removing failed filters and transferring them to the engineered containers. The estimated cost to treat this waste stream is between \$2 million to \$4 million.

Uncertainty Issues

Uncertainties exist in regard to the waste generation rate of this future waste stream and its impact on budget requirements since the quantity of stainless steel containment boxes to be fabricated is not known.

3.1E.2 Cadmium Safety/Control Rods

3.1E.2.1 GENERAL INFORMATION

Waste Stream Number: SR-W023

The preferred treatment option for Cadmium Safety/Control Rods is Macroencapsulation in a cask as a 90 day generator.

Background Information:

Cadmium rods encapsulated in stainless steel are used to control neutron flux in the reactors. Most rods are one inch in diameter and twenty-two feet long. There also are some smaller rods that were used in a test reactor. Cadmium is used as a neutron poison in the nuclear fission process.

Volume

- Current volume through 09/30/93 is 0.3 m³.
- Expected 1993-1997 volume will be 3.2 m³.

Waste Stream Composition

- Inorganic debris
- Cadmium containing metal debris

Waste Code

- D006A (TCLP Cd)

LDR Treatment Standard

- Concentration based standard = 1.0 mg/l
- Alternate debris technology may be applied

Waste Characterization

- Process knowledge and sampling and analysis used to characterize the waste.
- Contaminant level = 1473 mg/l Cd
- Confidence level high based on knowledge of materials of construction and TCLP analysis.
- TCLP analysis results on a non-radiated rod

Radiological Characterization

- Calculated radiation rates reported as 10-56 R/hr.
- Activation products and beta/gamma emitters Co⁶⁰, Ni⁵⁹ are present.
- Waste must be remotely handled.
- Mixed low-level waste

3.1E.2.2 TECHNOLOGY AND CAPACITY NEEDS

This waste qualifies as debris. It can be treated by one of 17 debris technologies or it can be treated to the concentration based treatment standard of 1 mg/l TCLP. Treatment standards for hazardous debris include physical extraction, chemical extraction or immobilization technologies. Cadmium Safety/Control Rods meet the definition of debris because they exceed the 60 mm size requirement and are a manufactured object. This waste stream is deemed inherently hazardous due to its fabrication with the toxic metal cadmium. Therefore, the debris must be immobilized. The regulatory definition of Macroencapsulation is application of a surface coating or use of a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media. In the fabrication of the Cadmium Safety/Control Rods a stainless steel sheathing is applied over the entire area of each rod effectively serving to macroencapsulate the cadmium. EPA Region IV has agreed

this stainless steel sheathing serves to macroencapsulate the rods. A citation for the EPA concurrence is located in Appendix A, under SR-W023 Treatment Justification.

3.1E.2.3 TREATMENT OPTION INFORMATION

SRS intends to store the Cadmium Safety/Control Rods in an existing cask until disposal facilities are available. Utilization of the existing storage cask saves considerable fabrication cost. However, the cask is not quite long enough to house the longest rods. To utilize the cask, the rods must be bent or cut. The determination has been made that it is most feasible to cut the rods. Such action would not expose cadmium since the cadmium does not run the full length of the rod. However, cutting the rods would affect the integrity of the stainless steel sheath, and thus require re-encapsulation in the cask by means of seal welding. A citation for the SCDHEC concurrence with the Cadmium Control and Safety Rod Management Plan can be found in Appendix A, under SR-W023 Treatment Justification.

3.1E.2.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

There is one available cask of sufficient size to contain all waste Cadmium Safety/Control Rods. Since the cask is presently available, no cost is listed for its fabrication. Introduction of the rods into the existing cask is estimated to cost \$75,000. This cost is associated with the handling of the rods after they are cut. The cask will be transported to each of the four reactors where the rods are stored and the rods will be placed into the cask. Sealing of the cask and the testing of the seal are included as a part of the cost estimate. There are other indirect costs associated with the handling of the rods prior to placing them in the cask. These costs include removing any lead snubbers left on the rods, equipping and modifying the saws at each of the reactors used to cut the rods, and preparation of the cask for the receipt of the rods. Costs for these activities are not included in the \$75,000 estimate.

The estimated cost to treat this waste stream is between \$600 thousand and \$1.5 million.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.1E.3 Mercury Contaminated Equipment

3.1E.3.1 GENERAL INFORMATION

Waste Stream Number: SR-W015

The preferred treatment option for the Mercury Contaminated Equipment waste stream is macroencapsulation as debris in a stainless steel box as a 90-day generator in the Tritium Facility. Existing inventory are in stainless steel boxes which meet the debris technology of macroencapsulation.

Background Information:

Failed or retired pumps used to pump tritium in the tritium production areas. Mercury was drained and poured from the pumps, but residual amounts still remain. Mercury is used as a pumping medium for the tritium gas. Lead may be present on some of the pumps as lead/tin solder from cooling coil construction, or collars for shielding, which are an integral part of the pump.

Volume

- Current volume through 09/30/93 is 9.8 m³.
- Expected 1993-1997 volume will be 3.1 m³.

Waste Stream Composition

- Inorganic Debris

Waste Code

- D008A (TCLP Pb)
- D009A (TCLP Hg)

LDR Treatment Standard

- D008A-D009A – concentration based standards = 0.2-5.0 mg/l
- Alternative debris technology may be applied

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium because no analytical data collected due to ALARA concerns.

Radiological Characterization

- Tritium – estimate 500 Ci/pump
- Waste is contact handled.
- Mixed low-level waste

3.1E.3.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred options is shown above. This waste qualifies as debris. It can be treated by one of 17 debris technologies or it can be treated to the concentration based treatment standard of 0.2 mg/l for mercury and 5 mg/l for lead (TCLP). This material qualifies as debris under the land disposal regulations because its particle size is larger than 60 mm and it is a manufactured object. There are a number of treatment alternatives for debris. However, the only alternative that satisfies the restriction for both lead and mercury and is a practical treatment for the highly tritiated waste form is Immobilization. The preferred option of Macroencapsulation meets the debris rule standard for the treatment of the waste codes found in this waste stream.

There are no capacity needs identified for treating as a 90-day generator at the Tritium Facility at this time.

3.1E.3.3 TREATMENT OPTION INFORMATION

This is expected to be a continuing waste stream as long as the Tritium Facility operates. Due to safety and health concerns surrounding tritium, failed and retired equipment contaminated with mercury were welded into engineered stainless steel boxes for long term storage, designed to withstand tritium offgassing for 100 years (half life of tritium is 12 years). When the LDR Debris Rule (57 FR 37194-37282, dated August 18, 1992) was promulgated, the performance standard for macroencapsulation stated the "encapsulating material must completely encapsulate debris and be resistant to degradation by the debris and its contaminants and materials into which it may come into contact after placement (leachate, other waste, microbes)." This form of storage (welding in stainless steel boxes) meets the macroencapsulation requirements and a document review to verify contents of the currently stored waste boxes has been completed.

Furthermore, future spent and retired equipment can now be considered handled under normal operations but regarded as waste treatment as a 90-day generator rather than waste packaging for transfer into RCRA storage. Current procedures require mercury contaminated equipment to be drained, then stored in satellite accumulation areas until sufficient quantities dictate removal and a box can be constructed. The pumps are moved into a staging area

where they are welded into the engineered box. The box is then transferred to a RCRA mixed waste storage facility for eventual disposal at the Hazardous Waste/Mixed Waste Disposal Vaults (not yet constructed).

Option Support Justification – IDOA Performed

- Waste already in storage meets debris technology of macroencapsulation and meets LDR requirements.
- Future waste can be treated without a permit, as a 90-day generator.
- Treatment option results in a treated waste that requires no additional processing prior to disposal.
- Treatment process requires little equipment

Facility Status

The process of macroencapsulating tritiated equipment in a tritium facility has been demonstrated.

Technology

The alternative immobilization debris technology of macroencapsulation is simple and can be performed in the Tritium Facility under special procedures; work has to be done in plastic suits.

Regulatory Status

Macroencapsulation would be performed on pumps and equipment coming out of service. This may be done under a "90-day Generator."

Preparation for Operation

An appropriate training program, inspection records, and a contingency plan will be developed and maintained.

3.1E.3.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

This treatment is funded by the current tritium operations budget.

The estimated cost to treat this waste stream is between \$3.5 million and \$7.5 million.

Uncertainty Issues

There are no uncertainties identified for this waste stream at this time. However, this waste stream is a subset of the mercury contaminated debris anticipated to be generated in future by Transition and D&D activities. Section 6.3 describes a future waste stream of mercury contaminated debris (SR-W062) for which a treatment capacity will need to be analyzed.

3.1E.4 Aqueous Mercury and Lead (Mercury Contaminated Recorder)

3.1E.4.1 GENERAL INFORMATION

Waste Stream Number: SR-W041C

The preferred treatment option for the Mercury Contaminated Recorder waste stream is Macroencapsulation and requesting regulatory discretion in treating with waste stream SR-W015 as a 90-day generator.

Background Information:

In the MWIR, SR-W041 is reported as a single waste stream, due to the fact that it is all in one drum. However, when evaluating the waste stream, it was recognized that the stream should be divided into its three distinct components. Thus, the stream numbers have been changed with the addition of an A, B, or C suffix. This portion of the waste stream is a mercury contaminated recorder (equipment) from analytical support of the Naval Fuels Development Facility in SRTC. The Naval Fuels Development Facility has been closed.

Volume

- Current volume through 09/30/93 is 0.1 m³.
- No future waste generation expected because waste generated from cleanout of laboratory which is no longer operational.

Waste Stream Composition

- Inorganic Debris (mercury recorder)

Waste Code

- D009A (TCLP Hg) Nonwastewater

LDR Treatment Standard

- D009A = concentration based standard – 0.2 mg/l
- Alternative debris technology may be applied.

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based on knowing process history of the recorder.

Radiological Characterization

- Tritium, alpha emitter is U²³⁸, and Beta/Gamma emitter.
- Waste is contact handled.
- Mixed low-level waste

3.1E.4.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. This waste qualifies as a debris. It can be treated by one of 17 debris technologies or be treated to the concentration based treatment standard of 0.2 mg/l TCLP mercury. The most effective treatment technology for this waste stream would be immobilization. This material qualifies as debris under the land disposal regulations because its particle size is larger than 60 mm and it is a

manufactured object. The preferred option of Macroencapsulation meets the Debris Rule standard.

3.1E.4.3 TREATMENT OPTION AND SUPPORT DATA

This is a very small volume of a single generation waste stream. It would appear most appropriate to handle the treatment of this waste in conjunction with the Mercury Contaminated Equipment (SR-W015) waste via macroencapsulation. A regulatory discretion agreement to move this over to be treated with waste stream SR-W015 when they prepare for macroencapsulating in a staging area, would be required. This would be cost effective and not require setting up a permitted facility. Incorporating this waste stream will not create capacity impacts.

Option Support Justification – IDOA Performed

- Preferred option utilizes treatment process that is simple, already exists, and is previously demonstrated to be capable of meeting LDR requirements.
- Treatment option results in a treated waste that requires no additional processing prior to disposal.
- Treatment process requires little equipment.
- Treatment activity results in minimal emissions and should be straight forward to permit resulting in faster treatment turn around time.
- Treatment process very cost effective.

Facility Status

The 232-H Tritium Facility will be set up for macroencapsulation as a 90-day generator when required.

Technology

The alternative immobilization debris technology of Macroencapsulation is well established. This waste stream can be combined with SR-W015. This waste stream could also be combined with SR-W013B.

Regulatory Status

SCDHEC will need to approve bringing this recorder from permitted storage and treating it in a 90-day generator staging area.

Preparation for Operation

Besides the conditions listed under Facility Status, an appropriate training program, inspection records, and a contingency plan would have to be developed and maintained.

3.1E.4.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

The estimated cost to treat this waste stream is included with the cost of SR-W015. The volume is so small compared to the volume of SR-W015 that the proportional share of the cost borne by SR-W041C is insignificant.

Uncertainty Issues

No technical uncertainties were identified for either waste treatment or radiological concerns. Because of the small volume of this waste stream, the cost to treat this stream (e.g., specified

technology requirements, complex treatment train, etc.) would be high if regulatory discretion is not approved for this waste. It is uncertain whether SCDHEC will agree to treat this waste with SR-W015.

Future wastes, similar to this stream, are anticipated to be generated as a result of Transition and D&D activities. Capacities are not known at this time, but rough estimates have been provided; see Section 6.0 for further discussion. A sitewide mercury contaminated debris waste stream (SR-W062) will be given greater detail in the FSTP. Evaluation of similar waste streams complex wide may render a more cost effective treatment of consolidated waste.

3.1E.5 Cadmium Coated HEPA Filters

3.1E.5.1 DESCRIPTION OF WASTE STREAM

Waste Stream Number: SR-W011

The preferred treatment option for Cadmium Coated HEPA Filters is acid leaching in M-Area followed by Vitrification in the M-Area Vendor Treatment Process.

Background Information:

This waste stream is high efficiency particulate air (HEPA) filters used to filter ventilation air from the reactors. The filter frames are hazardous due to cadmium plating on the metal frames. Replacement units are stainless steel framed filters. Some filter material is glued onto the frames while other waste containers hold the metal frames only (filters removed). Waste is stored in 12 mil plastic within carbon steel B-25 boxes.

Volume

- Current volume through 09/30/93 is 100.2 m³.
- No future waste generation expected because HEPA filters with cadmium coated filter frames are no longer used at this site and all cadmium filters have been removed from service and collected.

Waste Stream Composition

- Cadmium containing metal debris
- Inorganic debris

Waste Code

- D006A (TCLP Cd) Nonwastewater

LDR Treatment Standard

- Concentration based standard – 1.0 mg/l
- Alternate debris technology may be applied

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based on analytical results.
- A typical TCLP shows 154 mg/l Cd

Radiological Characterization

- Tritium – contamination level 10⁻⁸ nCi/g
- Waste is contact handled.
- Mixed low-level waste

3.1E.5.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred options is shown above. This waste stream qualifies as a debris. It can be treated by one of 17 debris technologies or it can be treated to the concentration based standard of 1.0 mg/l cadmium (TCLP).

M-Area has facilities which can perform the acid leaching operation and are adequately sized to handle the volume of waste. Equipment to perform this pretreatment will be needed. The actual volume of waste to be treated after etching is small and can be managed in the M-Area Vendor Treatment Process without difficulty.

3.1E.5.3 TREATMENT OPTION INFORMATION

The preferred option is to dissolve the cadmium by utilization of existing equipment in M-Area for acid leaching of the frames. Dissolved cadmium leaching solution can be stored in M-Area PWIT/SF and treated in M-Area LETF with the sludge vitrified in the M-Area Vendor Treatment Process. The remainder of the waste, which is acid leached filter frames minus the cadmium, will be handled as scrap metal.

Capacity requirements for treatment of this waste stream are one-time or campaign-based. The waste is no longer generated. The M-Area LETF is currently permitted as an industrial wastewater treatment facility. However, acid leaching is not one of its capabilities. Therefore, a permit modification to the wastewater permit may be necessary. Acid leaching and precipitation are well established and reliable technologies.

The permit applications for the M-Area Vendor Treatment Process were submitted June 24, 1994, to comply with the requirements of the Land Disposal Restriction Federal Facility Compliance Agreement. This waste stream will not be a part of the initial permit application submittal. As a result, to receive approval from SCDHEC to treat this waste in the Vitrification facility, a treatability study to show that this waste can be properly treated in the M-Area Vendor Treatment Process will be needed. Since no change in the vitrification treatment process will be needed to treat this waste, a permit modification for the industrial wastewater permit for the M-Area Vendor Treatment Process should not be required.

Since this waste stream is not in the original evaluation for treatment in the M-Area Vendor Treatment Process, it will be necessary to include an evaluation of the Cadmium Coated HEPA filter waste stream in the NEPA documentation. As directed by identification as a preferred treatment option for the Cadmium Coated HEPA Filters, the Waste Management EIS will supply the required evaluation.

Option Support Justification – IDOA Performed

- Waste stream volume reduction of 5:1 as opposed to volume increase with other options. Etched filters are salvageable as scrap metal. Represents good waste minimization practice. Treated waste in very stable end form.
- Utilizes existing facilities and requires minimal adjustments of existing Vendor contract.
- Permit modification requirements to allow treatment of this waste stream simple and straight forward.
- Cost effective treatment.

Facility Status

The 313-M or the 321-M facility that will perform the acid leaching and chemical precipitation step for the cadmium coated HEPA filter frames exists but will require some minor modifications to be converted over for cadmium etching. The 313-M and 321-M facilities are, however, scheduled to be shut down by 1997 as part of the changing missions at SRS. Current shutdown plans are being organized by the Reactor and Reactor Materials line organization. This option may require modification of plans in M-Area in order to allow the continued operation or restart of Building 313-M or 321-M until SR-W011 has been processed.

The M-Area Vendor Treatment Process is completely designed, with a contract awarded to the vendor for treating M-Area plating sludges and solutions. This additional stream has been given a preliminary analysis by the M-Area project team and identified as being able to feed into the vitrification melter without modification to the melter's construction or configuration. However, the Vendor contract would need to be modified to include this as well as the other additional wastes in the cost, storage, and other pertinent areas affected by the increase of waste volume.

Technology

Treatability demonstrations on the originally identified M-Area wastes have proven the technology to be reliable and able to treat the physical waste matrix types identified to meet LDR treatment standards. Treatability demonstrations for this waste stream may or may not have to be conducted, depending on its similarity to the M-Area plating sludges and solutions.

Regulatory Status

SRS intends to permit the treatment of waste in the M-Area Vendor Treatment Process by an industrial wastewater permit. The vitrification facility is an extension of the M-Area Liquid Effluent Treatment Facility and a part of that treatment train is permitted as an industrial wastewater facility. Preliminary response from SCDHEC has indicated agreement that permitting the vendor treatment facility under a wastewater permit is possible and acceptable. Under the requirements of the Land Disposal Restriction Federal Facility Compliance Agreement, SRS submitted permit applications to SCDHEC for the M-Area Vendor Treatment Process facility on June 24, 1994.

Major permits required are:

- a. Modification to the M-Area Industrial Wastewater Treatment Permit
- b. Interim Status Closure of the M-Area PWIT/SF
- c. Container Storage Permit (either expansion under SRS Part A Interim Status, or a Part B Permit)
- d. SCDHEC Air Quality Permit for process emissions

The NEPA documentation has been prepared and an Environmental Assessment (EA) conducted. A FONSI was issued on August 1, 1994.

Preparation for Operation

All required permit applications for treating the M-Area plating sludges and solutions were submitted on June 24, 1994 for the original scope (six streams). Since the major permit is a modification to the existing wastewater treatment permit, approval is anticipated within 6 months (12/94). Treatment of the M-Area LDR wastes (i.e., preparation of the initial homogeneous feed batch for the stabilization unit) is targeted to begin with 225 days of permit approvals. Delay in approval of any of the required permits could delay the startup of the treatment process. An additional permit modification to increase the capacity and name the other waste streams will need to be done as soon as possible in order not to impact the M-Area schedule for the plating sludges and solutions.

3.1E.5.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

This line item is not in the budget. The treatment requires budget planning and funding to be requested. Pretreatment location and equipment must be secured and the LETF industrial wastewater permit modified. The contract with vendor for waste stream treatment must be adjusted.

The cost to treat this waste stream is not included in the 5-year plan or any annual operating plan. The estimated cost to treat this waste stream is between \$1.5 million and \$3 million.

Uncertainty Issues

No technical uncertainties were identified for either waste treatment or radiological concerns. Applicability of additional evaluation under NEPA creates uncertainty related to budget and schedule for this treatment option. SRS will request SCDHEC approval for the proposed option in treating this waste under current wastewater treatment permit. Budget and scheduling uncertainties may arise regarding regulatory activities until final approval and permitting is received.

Section 3.1F Inorganic Sludges and Particulates

3.1F.1 M-Area Plating Line Sludge from Supernate Treatment

3.1F.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W004

The preferred treatment option for M-Area Plating Line Sludge from Supernate Treatment is Vitrification in the M-Area Vendor Treatment Process.

Background Information:

This waste stream is a sludge generated from the treatment of the supernate through the Dilute Effluent Treatment Facility (DETF) and stored in the Process Waste Interim Treatment/Storage Facility (PWIT/SF) in M-Area.

Volume

- Current volume through 09/30/93 is 356 m³.
- Expected 1993-1997 volume will be 490 m³.

Waste Stream Composition

- Inorganic Sludge/Particulate

Waste Code

- F006 (metal plating line waste, without cyanide), nonwastewater

LDR Treatment Standard

- Concentration based standards – 0.066-5.2 mg/l

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based upon knowledge that the process generates a listed hazardous waste.
- TCLP Leachate Results are Pb <.09 mg/l, Cr <.01 mg/l, Ni <.11 mg/l, Cd <.005 mg/l

Radiological Characterization

- Total activity is 0.015 Ci.
- Alpha emitters include U²³⁴, U²³⁵, U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

3.1F.1.2 TECHNOLOGY AND CAPACITY NEEDS

The treatment standards for the F006 waste code are concentration based standards. They include 0.51 mg/l for lead, 5.2 mg/l for chromium, 0.32 mg/l for nickel. F006 often contains cyanides. However, SRS has never used cyanides, cadmium, silver, lead, or chromium in its metal plating activities. Cyanide, silver, and cadmium have not been detected while lead and chromium have been detected at about 100 mg/kg (total constituent analysis).

This waste stream is one of the six original streams which served as a basis for the M-Area Vendor Treatment Process design. The total volume of these wastes projected to need treatment is approximately 2.8 million kg. This waste type is not anticipated to be generated in the future since the source of the waste, M-Area Plating operations, has been shut down and is not expected to operate again at SRS. The vitrification facility will be designed to treat waste at a rate of 5000 kg/day of glass.

3.1F.1.3 TREATMENT OPTION INFORMATION

Treatability studies performed on the M-Area Sludge by the SRTC determined that either a cementitious matrix or a vitrification process was capable of producing a final waste form capable of meeting the LDR requirements. Requests for bids were made to vendors capable of treating the waste stream using either method. It was determined that the vitrification process was the most cost effective method and that it would create the most stable waste form with the least volume generated.

Facility Status

The M-Area Vendor Treatment Process is completely designed, with a contract awarded to the vendor for treating M-Area plating sludges and solutions. However, the vendor contract would need to be modified to include other additional wastes identified by the DSTP in the cost, storage, and other pertinent areas affected by the increase of waste volume.

Technology

Treatability demonstrations on the originally identified M-Area wastes have proven the technology to be reliable and able to treat the physical waste matrix types identified to meet LDR treatment standards.

Regulatory Status

SRS intends to permit the treatment of waste in the M-Area Vendor Treatment Process by an industrial wastewater permit. The vitrification facility is an extension of the M-Area Liquid Effluent Treatment Facility and a part of that treatment train is permitted as an industrial wastewater facility. Preliminary response from SCDHEC has indicated agreement that permitting the vendor treatment facility under a wastewater permit is possible and acceptable. Under the requirements of the Land Disposal Restriction Federal Facility Compliance Agreement, SRS submitted permit applications to SCDHEC for the M-Area Vendor Treatment Process facility on June 24, 1994.

Major permits required are:

- a. Modification to the M-Area Industrial Wastewater Treatment Permit
- b. Interim Status Closure of the M-Area PWIT/SF
- c. Container Storage Permit (either expansion under SRS Part A Interim Status, or a Part B Permit)
- d. SCDHEC Air Quality Permit for process emissions

The NEPA documentation has been prepared and an EA conducted. A FONSI was issued on August 1, 1994.

Preparation for Operation

All required permit applications for treating the M-Area plating sludges and solutions were submitted on June 24, 1994 for the original scope (six streams). Since the major permit is a modification to the existing wastewater treatment permit, approval is anticipated within 6 months (12/94). Treatment of the M-Area LDR wastes (i.e., preparation of the initial homogeneous feed batch for the stabilization unit) is targeted to begin with 225 days of permit approvals. Delay in approval of any of the required permits could delay the startup of the treatment process. An additional permit modification to increase the capacity and name the other waste streams will need to be done as soon as possible in order not to impact the M-Area schedule for the plating sludges and solutions.

3.1F.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

This waste stream is one of six design basis waste streams intended to be treated by the M-Area Vendor Treatment Process. The six waste streams are SR-W004, SR-W005, SR-W029, SR-W037, SR-W038, and SR-W039. The estimated cost for the M-Area Vendor Treatment Process is between \$18 million and \$24 million.

The current SRS five year plan includes funding for M-Area Vendor Treatment Process at the "Target Level" only for Fiscal Years 1995 and 1996. The Annual Operating Plan has sufficient funds to support M-Area activities for Fiscal Year 1994.

Uncertainty Issues

SRS will request SCDHEC to approve the wastewater permit application and other associated permits for treating this waste. Budget and scheduling uncertainties may arise regarding regulatory activities until final approval and permitting is received.

3.1F.2 Mark 15 Filter Cake

3.1F.2.1 GENERAL INFORMATION

Waste Stream Number: SR-W005

The preferred treatment option for Mark 15 Filter Cake is Vitrification in the M-Area Vendor Treatment Process.

Background Information:

This waste stream is filter cake from the precipitation and filtration of slightly enriched uranium solution in M-Area. Waste was generated by treatment and precipitation of etching solution from metal plating operations on slightly enriched uranium slugs.

Volume

- Current volume through 09/30/93 is 15.4 m³.
- There will be no future generation of this waste because the manufacturing process which generated this waste is no longer operational.

Waste Stream Composition

- Inorganic Sludge/Particulate

Waste Code

- F006 (metal plating waste sludge, without cyanide), nonwastewater

LDR Treatment Standard

- Concentration based standards – 0.066-5.2 mg/l

Waste Characterization

- Process knowledge and sampling and analysis used to characterize the waste.
- Confidence level is high based upon knowledge that the process generated a listed hazardous waste. Primary components are Ni 6.6% by weight, U 50% by weight (1.1% of the U is U²³⁵).
- No direct TCLP result performed on this waste stream but TCLP performed on a similar waste stream.

Radiological Characterization

- Sampling results indicate total activity is 3.05 Ci.
- Alpha emitters are U²³⁴, U²³⁵, U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

3.1F.2.2 TECHNOLOGY AND CAPACITY NEEDS

The treatment standards for the F006 waste code in this waste stream are concentration based standards. The F006 constituent of concern in this waste stream is nickel. The treatment standard for nickel is 0.32 mg/l. F006 often contains cyanides. However, SRS has never used cyanides, cadmium, silver, lead, or chromium in its metal plating activities.

This waste stream is one of the six original streams which served as a basis for the M-Area Vendor Treatment Process design. The total volume of these wastes projected to need treatment is approximately 2.8 million kg. This waste type is not anticipated to be generated in the future since the source of the waste, M-Area Plating operations, has been shut down and is not expected to operate again at SRS. The vitrification facility will be designed to treat waste at a rate of 5000 kg/day of glass.

3.1F.2.3 TREATMENT OPTION INFORMATION

Treatability studies performed on the M-Area Sludge by the SRTC determined that either a cementitious matrix or a vitrification process was capable of producing a final waste form capable of meeting the LDR requirements. Requests for bids were made to vendors capable of treating the waste stream using either method. It was determined that the vitrification process was the most cost effective method and that it would create the most stable waste form with the least volume generated.

Facility Status

The M-Area Vendor Treatment Process is completely designed, with a contract awarded to the vendor for treating M-Area plating sludges and solutions. However, the vendor contract would need to be modified to include other additional wastes identified by the DSTP in the cost, storage, and other pertinent areas affected by the increase of waste volume.

Technology

Treatability demonstrations on the originally identified M-Area wastes have proven the technology to be reliable and able to treat the physical waste matrix types identified to meet LDR treatment standards.

Regulatory Status

SRS intends to permit the treatment of waste in the M-Area Vendor Treatment Process by an industrial wastewater permit. The vitrification facility is an extension of the M-Area Liquid Effluent Treatment Facility and a part of that treatment train is permitted as an industrial wastewater facility. Preliminary response from SCDHEC has indicated agreement that permitting the vendor treatment facility under a wastewater permit is possible and acceptable. Under the requirements of the Land Disposal Restriction Federal Facility Compliance Agreement, SRS submitted permit applications to SCDHEC for the M-Area Vendor Treatment Process facility on June 24, 1994.

Major permits required are:

- a. Modification to the M-Area Industrial Wastewater Treatment Permit
- b. Interim Status Closure of the M-Area PWIT/SF
- c. Container Storage Permit (either expansion under RCRA Part A Interim Status, or a RCRA Part B Permit)
- d. SCDHEC Air Quality Permit for process emissions

The NEPA documentation has been prepared and an EA conducted. A FONSI was issued on August 1, 1994.

Preparation for Operation

All required permit applications for treating the M-Area plating sludges and solutions were submitted on June 24, 1994 for the original scope (six streams). Since the major permit is a modification to the existing wastewater treatment permit, approval is anticipated within 6 months (12/94). Treatment of the M-Area LDR wastes (i.e., preparation of the initial homogeneous feed batch for the stabilization unit) is targeted to begin with 225 days of permit approvals. Delay in approval of any of the required permits could delay the startup of the treatment process. An additional permit modification to increase the capacity and name the other waste streams will need to be done as soon as possible in order not to impact the M-Area schedule for the plating sludges and solutions.

3.1F.2.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

This waste stream is one of six design basis waste streams intended to be treated by the M-Area Vendor Treatment Process. The six waste streams are SR-W004, SR-W005, SR-W029, SR-W037, SR-W038, and SR-W039. The estimated cost for the M-Area Vendor Treatment Process is between \$18 million and \$24 million.

The current SRS five year plan includes funding for M-Area Vendor Treatment Process at the "Target Level" only for Fiscal Years 1995 and 1996. The Annual Operating Plan has sufficient funds to support M-Area activities for Fiscal Year 1994.

Uncertainty Issues

SRS will request SCDHEC to approve the wastewater permit application and other associated permits in treating this waste. Budget and scheduling uncertainties may arise regarding regulatory activities until final approval and permitting is received.

3.1F.3 M-Area Nickel Plating Line Sludge

3.1F.3.1 GENERAL INFORMATION

Waste Stream Number: SR-W037

The preferred treatment option for M-Area Nickel Plating Line Sludge is Vitrification in the M-Area Vendor Treatment Process.

Background Information:

This waste stream is an inorganic sludge generated from the treatment of M-Area production wastewaters containing elevated quantities of metals (mostly nickel) in the M-Area Dilute LETF. The sludge is currently stored in the Process Waste Interim Treatment/Storage Facility (PWIT/SF). On June 28, 1994 waste stream SR-W054, Enriched Uranium Contaminated with Lead, was added to this waste stream. A study has shown that M-Area Vendor Treatment Process can treat the SR-W054 waste to meet treatment standards for lead. However, since the lead in SR-W054, is also a component that is found in F006, and since the F006 treatment standard for lead is lower, the waste code for SR-W054 is not listed here.

Volume

- Current volume through 09/30/93 is 1190 m³.
- No future waste generation expected because manufacturing process which generated this waste is no longer operational.

Waste Stream Composition

- Inorganic Sludge/Particulate

Waste Code

- F006 (metal plating line waste, without cyanide) nonwastewater

LDR Treatment Standard

- Concentration based standards 0.066-5.2 mg/l

Waste Characterization

- Process knowledge and sampling and analysis used to characterize the waste.
- Confidence level high based on availability of analytical results and knowledge that the process generates a listed hazardous waste.

Radiological Characterization

- Total activity is 11.05 Ci.
- Alpha emitters are U²³⁴, U²³⁵, U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

3.1F.3.2 TECHNOLOGY AND CAPACITY NEEDS

The treatment standards for the F006 waste code in this waste stream are concentration based standards. They include 0.51 mg/l for lead, 5.2 mg/l for chromium, 0.32 mg/l for nickel. F006 often contains cyanides. However, SRS has never used cyanides, cadmium, silver, lead, or chromium in its metal plating activities. Cyanide, silver, and cadmium have not been detected while lead and chromium have been detected at about 100-2000 mg/kg (total constituent analysis).

This waste stream is one of the six original streams which served as a basis for the M-Area Vendor Treatment Process design. The total volume of these wastes projected to need treatment is approximately 2.8 million kg. This waste type is not anticipated to be generated

in the future since the source of the waste, M-Area Plating operations, has been shut down and is not expected to operate again at SRS. The vitrification facility will be designed to treat waste at a rate of 5000 kg/day of glass.

3.1F.3.3 TREATMENT OPTION INFORMATION

Treatability studies performed on the M-Area Sludge by the SRTC determined that either a cementitious matrix or a vitrification process was capable of producing a final waste form capable of meeting the LDR requirements. Requests for bids were made to vendors capable of treating the waste stream using either method. It was determined that the vitrification process was the most cost effective method and that it would create the most stable waste form with the least volume generated.

Facility Status

The M-Area Vendor Treatment Process is completely designed, with a contract awarded to the vendor for treating M-Area plating sludges and solutions. However, the vendor contract would need to be modified to include other additional wastes identified by the DSTP in the cost, storage, and other pertinent areas affected by the increase of waste volume.

Technology

Treatability demonstrations on the originally identified M-Area wastes have proven the technology to be reliable and able to treat the physical waste matrix types identified to meet LDR treatment standards.

Regulatory Status

SRS intends to permit the treatment of waste in the M-Area Vendor Treatment Process by an industrial wastewater permit. The vitrification facility is an extension of the M-Area Liquid Effluent Treatment Facility and a part of that treatment train is permitted as an industrial wastewater facility. Preliminary response from SCDHEC has indicated agreement that permitting the vendor treatment facility under a wastewater permit is possible and acceptable. Under the requirements of the Land Disposal Restriction Federal Facility Compliance Agreement, SRS submitted permit applications to SCDHEC for the M-Area Vendor Treatment Process facility on June 24, 1994.

Major permits required are:

- a. Modification to the M-Area Industrial Wastewater Treatment Permit
- b. Interim Status Closure of the M-Area PWIT/SF
- c. Container Storage Permit (either expansion under RCRA Part A Interim Status, or a RCRA Part B Permit)
- d. SCDHEC Air Quality Permit for process emissions

The NEPA documentation has been prepared and an EA conducted. A FONSI was issued on August 1, 1994.

Preparation for Operation

All required permit applications for treating the M-Area plating sludges and solutions were submitted on June 24, 1994 for the original scope (six streams). Since the major permit is a modification to the existing wastewater treatment permit, approval is anticipated within 6 months (12/94). Treatment of the M-Area LDR wastes (i.e., preparation of the initial homogeneous feed batch for the stabilization unit) is targeted to begin with 225 days of permit approvals. Delay in approval of any of the required permits could delay the startup of the treatment process. An additional permit modification to increase the capacity and name

the other waste streams will need to be done as soon as possible in order not to impact the M-Area schedule for the plating sludges and solutions.

3.1F.3.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

This waste stream is one of six design basis waste streams intended to be treated by the M-Area Vendor Treatment Process. The six waste streams are SR-W004, SR-W005, SR-W029, SR-W037, SR-W038, and SR-W039. The estimated cost for the M-Area Vendor Treatment Process is between \$18 million and \$24 million.

The current SRS five year plan includes funding for M-Area Vendor Treatment Process at the "Target Level" only for Fiscal Years 1995 and 1996. The Annual Operating Plan has sufficient funds to support M-Area activities for Fiscal Year 1994.

Uncertainty Issues

SRS will request SCDHEC to approve the wastewater permit application and other associated permits in treating this waste. Budget and scheduling uncertainties may arise regarding regulatory activities until final approval and permitting is received.

3.1F.4 Plating Line Sump Material

3.1F.4.1 GENERAL INFORMATION

Waste Stream Number: **SR-W038**

The preferred treatment option for M-Area Plating Line Sump Material is vitrification in the M-Area Vendor Treatment Process.

Background Information:

A mixed waste stream generated as a one time clean out of the sump at a building in M-Area.

Volume

- Current volume through 09/30/93 is 0.4 m³.
- No future waste generation expected because manufacturing process which generated this waste is no longer operational.

Waste Stream Composition

- Inorganic Sludge

Waste Code

- D007A (TCLP Cr) nonwastewater

LDR Treatment Standard

- D007A = concentration based standard – 5.0 mg/l

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level high based on availability of analytical results.

Radiological Characterization

- Total activity is less than 10 nCi/g.
- Alpha emitters are U²³⁴, U²³⁵, and U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

3.1F.4.2 TECHNOLOGY AND CAPACITY NEEDS

The required treatment standard to meet LDR regulations for this waste code is a concentration based standard. The standard for chromium is 5.0 mg/l based on TCLP test results.

This waste stream is one of the six original streams which served as a basis for the M-Area Vendor Treatment Process design. The total volume of these wastes projected to need treatment is approximately 2.8 million kg. This waste type is not anticipated to be generated in the future since the source of the waste, M-Area Plating operations, has been shut down and is not expected to operate again at SRS. The vitrification facility will be designed to treat waste at a rate of 5000 kg/day of glass.

3.1F.4.3 TREATMENT OPTION INFORMATION

Treatability studies performed on the M-Area Sludge by the SRTC determined that either a cementitious matrix or a vitrification process was capable of producing a final waste form capable of meeting the LDR requirements. Requests for bids were made to vendors capable of treating the waste stream using either method. It was determined that the vitrification

process was the most cost effective method and that it would create the most stable waste form with the least volume generated.

Facility Status

The M-Area Vendor Treatment Process is completely designed, with a contract awarded to the vendor for treating M-Area plating sludges and solutions. However, the vendor contract would need to be modified to include other additional wastes identified by the DSTP in the cost, storage, and other pertinent areas affected by the increase of waste volume.

Technology

Treatability demonstrations on the originally identified M-Area wastes have proven the technology to be reliable and able to treat the physical waste matrix types identified to meet LDR treatment standards.

Regulatory Status

SRS intends to permit the treatment of waste in the M-Area Vendor Treatment Process by an industrial wastewater permit. The vitrification facility is an extension of the M-Area Liquid Effluent Treatment Facility and a part of that treatment train is permitted as an industrial wastewater facility. Preliminary response from SCDHEC has indicated agreement that permitting the vendor treatment facility under a wastewater permit is possible and acceptable. Under the requirements of the Land Disposal Restriction Federal Facility Compliance Agreement, SRS submitted permit applications to SCDHEC for the M-Area Vendor Treatment Process facility on June 24, 1994.

Major permits required are:

- a. Modification to the M-Area Industrial Wastewater Treatment Permit
- b. Interim Status Closure of the M-Area PWIT/SF
- c. Container Storage Permit (either expansion under SRS Part A Interim Status, or a Part B Permit)
- d. SCDHEC Air Quality Permit for process emissions

The NEPA documentation has been prepared and an EA conducted. A FONSI was issued on August 1, 1994.

Preparation for Operation

All required permit applications for treating the M-Area plating sludges and solutions were submitted on June 24, 1994 for the original scope (six streams). Since the major permit is a modification to the existing wastewater treatment permit, approval is anticipated within 6 months (12/94). Treatment of the M-Area LDR wastes (i.e., preparation of the initial homogeneous feed batch for the stabilization unit) is targeted to begin with 225 days of permit approvals. Delay in approval of any of the required permits could delay the startup of the treatment process. An additional permit modification to increase the capacity and name the other waste streams will need to be done as soon as possible in order not to impact the M-Area schedule for the plating sludges and solutions.

3.1F.4.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

This waste stream is one of six design basis waste streams intended to be treated by the M-Area Vendor Treatment Process. The six waste streams are SR-W004, SR-W005, SR-W029,

SR-W037, SR-W038, and SR-W039. The estimated cost for the M-Area Vendor Treatment Process is between \$18 million and \$24 million.

The current SRS five year plan includes funding for M-Area Vendor Treatment Process at the "Target Level" only for Fiscal Years 1995 and 1996. The Annual Operating Plan has sufficient funds to support M-Area activities for Fiscal Year 1994.

Uncertainty Issues

SRS will request SCDHEC to approve the wastewater permit application and other associated permits in treating this waste. Budget and scheduling uncertainties may arise regarding regulatory activities until final approval and permitting is received.

3.1F.5 Consolidated Incinerator (CIF) Ash

3.1F.5.1 GENERAL INFORMATION

Waste Stream Number: SR-W046

The preferred treatment option for Consolidated Incinerator (CIF) Ash is Stabilization using the Consolidated Incineration Facility Ashcrete Process.

Background Information:

A future waste stream composed of ash generated from the incineration of mixed waste in the CIF.

Volume

- Expected 1993-1997 volume generation is 62 m³.

Waste Stream Composition

- Inorganic Sludge/Particulate

Waste Code

- Numerous waste codes from feed waste/derived from rule. The ash waste stream will contain all of the listed waste codes that are fed into the CIF. Consult the RCRA Part B Permit Application for a complete listing.

LDR Treatment Standard

- Standards are too numerous to list. See the standards listed in 40 CFR 268.41-43.

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium based on the fact that this is a future waste stream and no analysis is available.

Radiological Characterization

- Radiological hazards are unknown at this time.
- Remote handled by design of the facility.
- Mixed low-level waste

3.1F.5.2 TECHNOLOGY AND CAPACITY NEEDS

The numerous waste codes projected for treatment in the CIF Ashcrete Process have BDATs, concentration based standards, and/or specified technologies too numerous to mention in detail. However, virtually all waste codes listed in the CIF permit have incineration or stabilization as the BDAT and/or Specified Technology. Some waste codes have a concentration based standard.

Stabilization of the CIF Ash not only provides the recommended treatment (BDAT), but serves as a cost effective and environmentally sound method for stabilization of the ash prior to disposal.

CIF Ash is a future waste stream. The ashcrete process is under construction as part of the CIF. Capacity has been determined based on projections of volumes of waste at SRS projected to require treatment by incineration. The capacity-limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of the CIF Blowdown. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.1F.5.3 TREATMENT OPTION INFORMATION

SRS committed to reassess the evaluation of waste streams for which incineration originally had been determined to be the best and most practical treatment technology. The CIF Mission Need and Design Capacity Review (7/7/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 7/29/93) re-evaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to generally re-examine the appropriateness of each Functional Performance Requirement (FPR) design basis waste group. The FPR is an initial engineering design document that defines the scope of the design project and serves as a baseline for subsequent project design work. The review included additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to FPR nonradioactive waste groups that were addressed in the FPR. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA LDR requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Facility Status

The CIF is completely designed and as of June 30, 1994, construction is 80% complete. The facility is fully funded and is anticipated to have construction complete December 31, 1995. Start date to treat mixed waste is anticipated to be February 1996.

Technology

Treatability demonstrations for this waste stream may or may not have to be conducted, depending on its similarity to the wastes the CIF was designed to handle.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an Environmental Assessment was prepared for the CIF and a 60-day public comment period was held for the proposed Finding of No Significant Impact (FONSI). The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

Preparation for Operation

Construction is on schedule for the CIF.

3.1F.5.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

The estimated cost for operation of the ashcrete system is \$6 million to \$11 million. This cost is already included in the estimate for SR-W001 and should not be added to that cost.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.1F.6 Tank E-3-1 Clean Out Material

3.1F.6.1 GENERAL INFORMATION

Waste Stream Number: SR-W049

The preferred treatment option for the Tank E-3-1 Clean Out Material is Stabilization with grout at an offsite DOE facility; the Idaho National Engineering Laboratory/Waste Engineering Development Facility (INEL/WEDF) Stabilization Unit.

Background Information:

The waste stream consists of mercury contaminated rocks, dirt, sand, concrete, and glass cleaned out of the bottom of Tank E-3-1, a sump receipt tank in H-Area.

Volume

- Current volume through 09/30/93 is 1.4 m³.
- No future waste generation expected as this is a one time generation.

Waste Stream Composition

- Inorganic Sludges

Waste Code

- D009A (TCLP Hg) nonwastewater

LDR Treatment Standard

- Concentration based standard = 0.2 mg/l

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based upon analytical results.
- TCLP indicates typical mercury concentration is 14 mg/l.

Radiological Characterization

- Activity level is <80 d/m/ml.
- Beta/gamma emitter
- Waste is contact handled.
- Mixed low-level waste

3.1F.6.2 TECHNOLOGY AND CAPACITY NEEDS

This waste stream contains some debris substances such as rocks and possibly a few man-made items that fell into the sump area. The concentration based treatment standard for mercury 0.2 mg/l, based on TCLP.

After performing an options analysis, stabilization was found to be the appropriate technology to treat the waste stream, given its physical matrix and mercury contaminant. Different DOE stabilization units were evaluated and the SRS chose the INEL/WEDF as the location of choice, based on information (funding, schedules, etc.) provided to SRS by INEL and DOE-HQ. A process flow diagram for treatment of the waste stream was not provided by INEL at this time.

The capacity needs of the INEL/WEDF are unknown to SRS at this time.

3.1F.6.3 TREATMENT OPTION INFORMATION

Stabilization in the INEL/WEDF process is an appropriate treatment option since most of the material in the waste is part of normal concrete. Stabilization has been demonstrated to meet the concentration based treatment standard.

Option Support Justification – IDQA Performed

- Preferred option represents a proven, demonstrated technology that is known to be capable of meeting LDR requirements.
- Option represents a cost effective treatment process.

Facility Status

The INEL/WEDF Stabilization Unit is existing, but not permitted to handle mixed waste.

Technology

Stabilization of this waste stream containing low-levels of mercury is an acceptable form of treatment to meet the LDR treatment standard.

Regulatory Status

Unknown to SRS at this time.

Preparation for Operation

Unknown to SRS at this time.

3.1F.6.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

The estimated cost to treat this waste stream is less than \$150 thousand.

Uncertainty Issues

This technology has been determined suitable for treating the hazardous constituent of the waste stream. However, the waste's characterization in relation to the DOE-INEL/WEDF Stabilization Unit's WAC, has not been fully analyzed.

Applicability of additional evaluation under NEPA may create uncertainties related to budget and schedule for this treatment option.

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Section 3.1G Elemental Mercury

3.1G.1 Gold Traps

3.1G.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W024

The preferred treatment option for Gold Traps is amalgamation. The waste stream already meets the treatment standard.

Background Information:

This waste stream contains gold foil which traps elemental mercury entrained in process gases in the tritium facility. A typical trap consists of a stainless steel cylindrical housing that is 38 inches high and two inches in diameter that contains gold foil on 16 evenly spaced trays.

Volume

- Current volume through 09/30/93 is 2.3 m³.
- Expected 1993-1997 volume will be 0.2 m³.

Waste Stream Composition

- Elemental Mercury

Waste Code

- D009D (Elemental mercury contaminated with radioactive materials)

LDR Treatment Standard

- Specified technology = amalgamation

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based on knowledge of the process that generates the waste.
- No direct analysis made because of ALARA concerns for tritium.

Radiological Characterization

- Total activity estimated to be 1.6 x 10⁹ nCi/g.
- Tritium present.
- Waste is contact handled.
- Mixed low-level waste

3.1G.1.2 TECHNOLOGY AND CAPACITY NEEDS

Amalgamation is the specified technology for this waste code. Amalgamation is a process which utilizes inorganic reagents such as copper, zinc, nickel, gold and sulfur and results in a semi-solid amalgam, thereby reducing potential emissions of elemental mercury vapors into the air. Mercury is as an impurity that must be removed from the tritium gas to meet the stringent purity standards set for the final tritium product. Through analysis on the tritium gas operation, the Savannah River Site made the regulatory interpretation (ESH-FSS-920721, dated September 28, 1992) that amalgamation of mercury in the tritium processing operations meets the specified treatment for waste elemental mercury (D009D – elemental mercury).

3.1G.1.3 TREATMENT OPTION INFORMATION

Mercury pumps move the tritium gas through the tritium process. The radioactive elemental mercury that exits the pump and becomes entrained in the tritium gas must be removed to

meet the DOE's stringent purity standards for tritium gas. These gold traps remove the radioactive elemental mercury from the product gas via amalgamation, which also is the prescribed treatment technology for this waste stream when it exits the unit in which it was generated. To protect personnel and reduce radiation exposure, the entire gold trap is taken out of service and replaced at a frequency to insure product consistency. Therefore, the radioactive elemental mercury is treated per the required technology and can be disposed in the HW/MW Disposal Facility, in accordance with the amalgamation treatment for mercury in the Third Third Final Rule.

SRS transmitted the regulatory analysis of this process to EPA Region IV in September 1992. On October 2, 1992, EPA Region IV agreed that the gold traps met the LDR treatment standard of amalgamation.

3.1G.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

There is no actual waste treatment cost associated with the use of gold foil to capture mercury in the tritium facility since this is part of the tritium production process. The preparation of gold foil to serve as the amalgamation unit is done at SRS. The canister in which the foil is housed is fabricated onsite from metal pipe. After the foil has been reacted, the canisters are sealed and overpacked with Pearlite® in a stainless steel drum. A drum is considered filled when two canisters have been overpacked. The drum lid is then welded shut. The cost associated with the waste stream is the cost of preparing the waste canisters and sealing the storage drum. This cost is approximately \$1500 per event.

The estimated cost to treat this waste stream is less than \$30 thousand.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.1G.2 Tritiated Mercury

3.1G.2.1 GENERAL INFORMATION

Waste Stream Number: SR-W014

The preferred treatment option for the Tritiated Mercury waste stream is Amalgamation at an offsite DOE facility, the Idaho National Engineering Laboratory/Waste Engineering Development Facility (INEL/WEDF) – Amalgamation Unit.

Background Information:

This waste stream is elemental mercury used as a pumping fluid for tritium gas. The mercury waste is generated from pump maintenance or pump failure due to mercury oxide fouling. The waste contains floating slag or an oxidized layer from the erosion/leaching of stainless steel pump housings and pipes. Most of the tritium contamination is in the floating mercury oxide layer.

Volume

- Current volume through 09/30/93 is 0.3 m³.
- Expected 1993-1997 volume will be 0.1 m³.

Waste Stream Composition

- Elemental Mercury

Waste Code

- D009D (Elemental mercury)

LDR Treatment Standard

- Specified technology = Amalgamation

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level high based on the fact waste is elemental mercury with a small oxide layer.

Radiological Characterization

- Total activity is 350 nCi/g with tritium present.
- Waste is contact handled.
- Mixed low-level waste

3.1G.2.2 TECHNOLOGY AND CAPACITY NEEDS

Elemental mercury contaminated with radioactive materials has a specified technology to meet LDR regulations. That technology is Amalgamation. Different DOE amalgamation units were evaluated and the SRS chose the INEL/WEDF-Amalgamation Unit as the location of choice, based on information (funding, schedules, etc.) provided to SRS by INEL and DOE-HQ. A process flow diagram for treatment of the waste stream was not provided by INEL at this time.

The capacity needs of the INEL/WEDF-Amalgamation Unit are unknown to SRS at this time.

3.1G.2.3 TREATMENT OPTION INFORMATION

This treatment option was selected as the preferred option even though it did not have the highest score from the IDOA process. The SRS technical analysis team determined through

engineering assessment the identified preferred treatment option represented the most feasible treatment alternative for the waste stream at this time.

Option Support Justification – IDOA Performed

- The INEL has an amalgamation facility in an advanced planning stage that is anticipated to be ready to accept waste before SRS could have any treatment funded and ready onsite.
- Utilization of the offsite DOE facility would be a cost effective strategy for SRS as well as serving to treat this waste stream in a more timely manner.

Facility Status

The INEL/WEDF – Amalgamation Unit is a planned and approved facility addition.

Technology

Amalgamation of this waste stream containing elemental mercury is the specified technology to meet the LDR treatment standard.

Regulatory Status

WEDF will pursue a modification to their RCRA Interim Status permit for this planned facility.

Preparation for Operation

Future facility – not applicable.

3.1G.2.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Cost would be incurred in preparing this waste stream for shipment and transporting it to Idaho. Treated residues would be returned to SRS for disposal. Funding would need to be requested to support proper containerization and transportation.

The estimated cost to treat this waste stream is less than \$250 thousand.

Uncertainty Issues

This technology is the specified technology for treating mercury. However, the waste's level of tritium in relation to the INEL/WEDF – Amalgamation Unit's WAC has not been fully analyzed. Also, transportation of this waste stream to the INEL for treatment raises uncertainties regarding approval by affected state agencies (e.g., receiving state and corridor states) and their stakeholders.

There is some uncertainty about an offsite option selection until completion of negotiations, administrative procedures, and verification of appropriate treatment is finalized.

3.1G.3 Aqueous Mercury and Lead (Elemental Mercury)

3.1G.3.1 GENERAL INFORMATION

Waste Stream Number: SR-W041B

The preferred treatment option for the Elemental Mercury portion of the Aqueous Mercury and Lead waste stream is Amalgamation at an offsite DOE facility, the Idaho National Engineering Laboratory/Waste Engineering Development Facility (INEL/WEDF) – Amalgamation Unit.

Background Information:

In the MWIR, SR-W041 is reported as a single waste stream, due to the fact that it is all in one drum. However, upon evaluation, it was recognized that the stream should be divided into its three distinct compounds. Thus, the stream numbers have been changed with the addition of an A, B, or C suffix. This portion of the waste stream is two 0.5 liter bottles of elemental mercury. This waste was generated by SRTC operations in support of the Naval Fuels Developmental Facility (779-A) which is now closed.

Volume

- Current volume through 09/30/93 is 0.01 m³.
- No future waste generation expected because waste generated from cleanout of laboratory which is no longer operational.

Waste Stream Composition

- Elemental Mercury

Waste Code

- D009D (elemental Hg)

LDR Treatment Standard

- Specified technology is amalgamation.

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based on the waste composition.

Radiological Characterization

- Tritium, alpha emitter is U²³⁸, and beta/gamma emitter.
- Waste is contact handled.
- Mixed low-level waste

3.1G.3.2 TECHNOLOGY AND CAPACITY NEEDS

Elemental mercury contaminated with radioactive materials has a specified technology to meet LDR regulations. Different DOE amalgamation units were evaluated and the SRS chose the INEL/WEDF – Amalgamation Unit as the location of choice, based on information (funding, schedules, etc.) provided to SRS by INEL and DOE-HQ. A process flow diagram for treatment of the waste stream was not provided by INEL at this time.

The capacity needs of the INEL/WEDF – Amalgamation Unit are unknown to SRS at this time.

3.1G.3.3 TREATMENT OPTION INFORMATION

This treatment option was selected as the preferred option even though it did not have the highest score from the IDOA process. The SRS technical analysis team determined through

engineering assessment that the identified preferred treatment option represented the most feasible treatment alternative for the waste stream at this time.

Option Support Justification – IDOA Performed

- The INEL has an amalgamation facility in an advanced planning stage that is anticipated to be ready to accept waste before SRS could have any treatment funded and ready onsite.
- Utilization of the offsite DOE facility would be a cost effective strategy for SRS as well as serving to treat this waste stream in a more timely manner.

Facility Status

The INEL/WEDF – Amalgamation Unit is a planned and approved facility addition.

Technology

Amalgamation of this waste stream containing elemental mercury is the specified technology to meet the LDR treatment standard.

Regulatory Status

WEDF will pursue a modification to their RCRA Interim Status permit for this planned facility.

Preparation for Operation

Future facility – not applicable.

3.1G.3.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Cost would be incurred in preparing this waste stream for shipment and transporting it to INEL. Treated residues would be returned to SRS for disposal. Funding would need to be requested to support proper containerization and transportation.

The estimated cost to treat this waste stream is less than \$350 thousand.

Uncertainty Issues

This technology is the specified technology for treating mercury. Transportation of this waste stream to the INEL for treatment raises uncertainties regarding approval by affected state agencies (e.g., receiving state and corridor states) and their stakeholders.

There is some uncertainty about an offsite option selection until completion of negotiations, administrative procedures, and verification of appropriate treatment is finalized.

Section 3.1H Organic Debris

3.1H.1 Solvent Contaminated Debris (LLW)

3.1H.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W003

The preferred treatment option for the Solvent Contaminated Debris (LLW) waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

Spent solvent contaminated rags and wipes are generated sitewide in the clean up of interior spills and for decontamination. The stream is a collection of similar debris whose LDR treatment standards can be met by incineration followed by stabilization. The waste codes indicate the components which may be present in the waste stream as a whole. Waste codes listed in the waste stream would vary depending on where the waste came from within SRS.

Volume

- Current volume through 09/30/93 is 5.4 m³.
- Expected 1993-1997 volume will be 2.0 m³.

Waste Stream Composition

- Organic Debris

Waste Code

- D004A thru D011A (TCLP Metals), D012 thru D043 (Characteristic Organics), F001 thru F003, F005A (halogenated and nonhalogenated spent solvents)

LDR Treatment Standard

- D004A-D017, F001-F003, F005A – concentration based standards = 0.066-170 mg/kg except F005A 2-Ethoxyethanol, 2-Nitropropane = Incineration
- D018-D043 = no treatment standard yet developed by EPA
- Alternate debris technology may be applied

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based upon known composition of the solvents used in the process generating this waste.

Radiological Characterization

- Alpha emitter, Pu²³⁸
- Beta/gamma emitter, Cs¹³⁷
- Waste is contact handled.
- Mixed low-level waste

3.1H.1.2 TECHNOLOGY AND CAPACITY NEEDS

This waste stream meets the LDR definition for debris and can be treated by one of seventeen debris technologies or be treated to the waste specific concentration based standard.

The F-listed waste codes, characteristic metal waste codes and the first six characteristic organic waste codes for this waste stream all have concentration based treatment standards. The characteristic metals have treatment standards determined by a TCLP analysis. The organics have standards based on total composition. Treatment standard for each waste code is:

- D004 (Arsenic - As) = 5.0 mg/l,
- D005 (Barium - Ba) = 100 mg/l,
- D006 (Cadmium - Cd) = 1.0 mg/l,
- D007 (Chromium - Cr) = 5.0 mg/l,
- D008 (Lead - Pb) = 5.0 mg/l,
- D009 (Mercury - Hg) = 0.2 mg/l,
- D010 (Selenium - Se) = 5.7 mg/l,
- D011 (Silver - Ag) = 5.0 mg/l,
- D012 (Endrin) = 0.13 mg/kg,
- D013 (Lindane) = 0.066 mg/kg,
- D014 (Methoxychlor) = 0.18 mg/kg,
- D015 (Toxaphene) = 1.3 mg/kg,
- D016 (2,4-D) = 10.0 mg/kg,
- D017 (2,4,5-TP (Silvex)) = 7.9 mg/kg
- F001-F003 and F005 = 0.75 mg/l-170 mg/l except incineration for 2-Ethoxyethanol and 2-Nitropropane

There are no BDATs, specified technologies, or treatment standards developed for any of the organic chemicals from D018 to D043.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.1H.1.3 TREATMENT OPTION INFORMATION

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, initial incineration provides organic contaminant destruction and proper volume reduction in preparation for stabilization of the metals in the waste stream.

This waste stream is one of the target waste streams on which the design of the CIF is based.

The CIF Mission Need and Design Capacity Review (7/7/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 7/29/93) re-evaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to re-examine the appropriateness of each Functional Performance Requirement (FPR) design basis waste group. The FPR is an initial engineering design document that defines the scope of the design project and serves as a baseline for subsequent project design work. The review included additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to FPR nonradioactive waste groups that were addressed in the FPR. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA LDR requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Facility Status

The CIF is completely designed and as of June 30, 1994 construction was 80% complete. The facility is fully funded and anticipated to have construction complete by December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed FONSI. The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

This waste stream is covered in the RCRA Part B Permit application submitted to SCDHEC for the Consolidated Incineration Facility (CIF), which is presently under construction by authority of a RCRA permit.

Preparation for Operation

Construction is on schedule for the CIF.

3.1H.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

This waste stream is one of the design basis waste streams for CIF.

The estimated cost to treat this waste stream is included with the cost of SR-W001.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.1H.2 Toxic Clean Up Material

3.1H.2.1 GENERAL INFORMATION

Waste Stream Number: SR-W012

The preferred treatment option for the Toxic Clean Up Material waste stream is incineration in the Consolidated Incineration Facility.

Background Information:

Various clean up materials such as rags, wipes, mopheads, gloves, etc., contaminated with toxic, characteristic, hazardous waste and radioactive materials. The waste stream is a collection of similar debris whose LDR treatment standards can be met by incineration followed by stabilization. The list of waste codes indicate the components which may be present in the waste. Waste from specific areas within SRS may not contain all the waste codes.

Volume

- Current volume through 09/30/93 is 0.8 m³.
- Expected 1993-1997 volume will be 1.0 m³.

Waste Stream Composition

- Organic Debris

Waste Code

- D004A (TCLP As), D005A (TCLP Ba), D006A (TCLP Cd), D007A (TCLP Cr), D008A (TCLP Pb), D009A (TCLP Hg), D009B (high organic Hg), D009C (high inorganic Hg), D010A (TCLP Se), D011A (TCLP Ag), D018 (benzene)

LDR Treatment Standard

- D004A-D011A concentration based standard – 0.2-100 mg/l
- D009B = Specified Technology – Incineration of wastes containing organics and mercury
- D009C = Specified Technology – Retorting or roasting in a thermal processing unit capable of volatilizing mercury
- D018 = no treatment standard yet developed by EPA
- Alternate debris technology may be applied

Waste Characterization

- Some process knowledge used to characterize the waste stream.
- Confidence level is medium because no analytical data is available. Confidence level is based on knowing some information on the nature of the spill and concentration of the liquids cleaned up.

Radiological Characterization

- Alpha (U²³⁵, Pu²³⁸, Pu²³⁹) and Beta/Gamma Emitter (Cs¹³⁷) emitters present.
- Waste is contact handled.
- Mixed low-level waste

3.1H.2.2 TECHNOLOGY AND CAPACITY NEEDS

This waste stream meets the LDR definition for debris and can be treated by one of the seventeen debris technologies or be treated to the waste specific concentration based treatment standards listed below.

D009B, the high mercury subcategory – waste with more than 260 mg/kg of total mercury and D009C, high mercury containing inorganics subcategory, have specified technologies. For D009B the specified technology is incineration for high organic waste streams followed by roasting and retorting if the ash still contains higher than 260 mg/kg mercury (IMERC). For the D009C waste code the specified technology is recovery of mercury (RMERC). Two cleanups in the Separations areas that are included in this waste stream involved mercury spill clean ups. The waste was characterized using process knowledge but the amount of total mercury was not analyzed. Interviews with the generators indicate the waste is D009A – TCLP for Hg, and the waste stream has been analyzed as such for its preferred treatment option. Prior to treatment at the CIF, the waste will be analyzed and the determination will be made if the wastes from the Separation areas cleanups must be segregated and treated by way of IMERC or RMERC. In the interim, the toxic cleanup material waste stream will carry D009B and D009C codes, since analysis is the only way to confirm the level of mercury.

The capacity limiting CIF subsystem is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.1H.2.3 TREATMENT OPTION INFORMATION

The CIF Mission Need and Design Capacity Review (7/7/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 7/29/93) re-evaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to re-examine the appropriateness of each Functional Performance Requirement (FPR) design basis waste group. The FPR is an initial engineering design document that defines the scope of the design project and serves as a baseline for subsequent project design work. The review included additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to FPR nonradioactive waste groups that were addressed in the FPR. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA LDR requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Facility Status

The CIF is completely designed and as of June 30, 1994 construction was 80% complete. The facility is fully funded and anticipated to have construction complete by December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed FONSI. The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

This waste stream is covered in the RCRA Part B Permit application submitted to SCDHEC for the Consolidated Incineration Facility (CIF), which is presently under construction by authority of a RCRA permit.

Preparation for Operation

Construction is on schedule for the CIF.

3.1H.2.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

This waste stream is one of the design basis waste streams for CIF. The estimated cost to treat this waste stream is included with the cost of SR-W001.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.1H.3 Filter Paper Take Up Rolls

3.1H.3.1 GENERAL INFORMATION

Waste Stream Number: SR-W018

The preferred treatment option for the Filter Paper Take Up Rolls waste stream is pretreatment by cutting or shredding, Incineration followed by stabilization in the Consolidated Incineration Facility.

Background Information:

This waste consists of "tyvek" filter paper contaminated with residual filter cake and filter media from the filtering of M-Area metal plating sludges (F006 waste). No cyanide, lead, silver, chromium or cadmium were used in the plating line operation. The rolls are six feet long and two feet in diameter.

Volume

- Current volume through 09/30/93 is 257 m³.
- Expected 1993-1997 volume will be 5.0 m³.

Waste Stream Composition

- Organic Debris

Waste Code

- F006 (metal plating line waste, without cyanide)

LDR Treatment Standard

- Concentration based standard = 0.066-5.2 mg/l

Waste Characterization

- Process knowledge and sampling and analysis used to characterize the waste.
- Confidence level high due to availability of sample results and knowledge the process generates listed waste.
- Primary contaminant is Ni. Others included are Cd, Cr, Pb, and Ag.

Radiological Characterization

- Total activity 0.0173 Ci/kg.
- Alpha emitters are U²³⁴, U²³⁵, and U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

3.1H.3.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. This waste stream is significantly different from the waste description for other SRS F006 wastes. The waste description is a wastewater treatment sludge from electroplating operations. It is very different because the minute amounts of sludge are deposited on a filter paper media. The waste stream is 50% filter cake and 50% filter media. The contaminant is nickel. The concentration based treatment standard for nickel is 0.32 mg/l.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.1H.3.3 TREATMENT OPTION INFORMATION

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, initial incineration provides organic contaminant destruction and proper volume reduction in preparation for stabilization of the metals in the waste stream.

The CIF provides appropriate treatment for all of the waste codes and should be able to meet the concentration standards for this waste stream. The incineration process will reduce the volume of waste which is organic (rags, wipes, etc.) and should increase the efficiency of the stabilization process while reducing the volume of waste for disposal. This treatment train is recognized in regulatory guidance as appropriate treatment for waste streams such as the Filter Paper Take Up Rolls.

Option Support Justification – IDOA Performed

- The preferred option technology is well demonstrated and represents accepted technology for meeting LDR treatment requirements.
- Treatment using the preferred option will result in significant volume reduction after treatment of at least 2:1.
- The preferred option is an existing, onsite facility. Treatment of this waste stream will require no additional equipment or operating personnel at CIF. However, pretreatment (i.e., repackaging) will be needed before the waste can be accepted at CIF.

- The treatment train minimizes waste handling and exposure concerns. The waste does not require additional treatment for disposal.

Facility Status

The CIF is completely designed and as of June 24, 1994, construction is 80% complete. The facility is fully funded and is anticipated to have construction complete December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Technology

Treatability demonstrations for this waste stream may or may not have to be conducted, depending on its similarity to the wastes the CIF was designed to handle.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed FONSI. The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

The waste codes for this waste stream are covered in the Part B Permit Application submitted to SCDHEC for the CIF which is presently under construction by authority of a RCRA permit.

Preparation for Operation

Construction is on schedule for the CIF. However, a pretreatment step to repackage the waste to meet the CIF WAC is required. Further detail on where this operation will be accomplished is being analyzed.

3.1H.3.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste. The estimated cost to treat this waste stream is between \$4 million and \$9 million.

Uncertainty Issues

No technical uncertainties were identified for either waste treatment or radiological concerns. SRS is requesting SCDHEC/EPA to approve and permit the pretreatment requirements (size reduction for packaging to meet the CIF WAC) for the proposed treatment option for this waste stream. Budget and scheduling uncertainties may arise until regulatory approval is complete.

3.1H.4 Mark 15 Filter Paper

3.1H.4.1 GENERAL INFORMATION

Waste Stream Number: SR-W028

The preferred treatment option for the Mark 15 Filter Paper waste stream is pretreatment by cutting or shredding, Incineration followed by stabilization in the Consolidated Incineration Facility (CIF).

Background Information:

The filter paper is from a plate and frame filter press used in M-Area to filter etching solution from nickel plating solutions. No cyanide, silver, cadmium, chromium, or lead were used in plating operations. The filter paper is contaminated with residual filter cake.

Volume

- Current volume through 09/30/93 is 1.0 m³.
- No future waste generation expected because the manufacturing process which generated this waste is no longer operational.

Waste Stream Composition

- Organic Debris

Waste Code

- F006 (metal plating line waste, without cyanide)

LDR Treatment Standard

- Concentration based standard = 0.066-5.2 mg/l

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based upon analysis on a similar material and knowledge that the process generates a listed hazardous waste.
- Metals present are primarily Ni with Pb, Ag, Cd and Cr.

Radiological Characterization

- Total activity is 10-100 nCi/g.
- Alpha emitters are U²³⁴, U²³⁵, U²³⁶, and U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

3.1H.4.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. The constituent of concern in this F006 waste stream is nickel. The treatment standard for nickel as a component of F006 is 0.32 mg/l. This waste stream is not significantly different from the waste description for SR-W005 since it is a combination of Mark 15 Filter Cake and Filter Paper.

The CIF will have spare capacity to treat other SRS wastes in addition to the design basis waste streams. SRS mission changes have reduced the expected quantity of the design basis waste feeds. Newly identified waste can replace some portion of the original design basis waste feeds immediately after CIF startup.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates for the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.1H.4.3 TREATMENT OPTION INFORMATION

Option Support Justification – IDOA Performed

- The preferred option technology is well demonstrated and represents accepted technology for meeting LDR treatment requirements.
- Treatment using the preferred option will result in significant volume reduction after treatment of at least 2:1.
- The preferred option is an existing, onsite facility. Treatment of this waste stream will require no additional equipment or operating personnel.
- The treatment train minimizes waste handling and exposure concerns. Waste does not require additional treatment for disposal.

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, initial incineration provides organic contaminant destruction and proper volume reduction in preparation for stabilization of the metals in the waste stream.

Facility Status

The CIF is completely designed and as of June 30, 1994, construction is 80% complete. The facility is fully funded and is anticipated to have construction complete December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Technology

Treatability demonstrations for this waste stream may or may not have to be conducted, depending on its similarity to the wastes the CIF was designed to handle.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an Environmental Assessment was prepared for the CIF and a 60-day public comment period was held for the proposed Finding of No Significant Impact (FONSI). The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

The waste code for this waste stream is covered in the Part B Permit Application submitted to SCDHEC for the CIF which is presently under construction by authority of a RCRA permit.

Preparation for Operation

Construction is on schedule for the CIF. However, a pretreatment step to repackage the waste to meet the CIF WAC is required. Further detail on where this operation will be accomplished is being analyzed.

3.1H.4.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste. The estimated cost to treat this waste stream is included with the cost of SR-W018. The volume is so small compared to the volume of SR-W028 that the proportional share of the cost borne by SR-W028 is insignificant.

Uncertainty Issues

No technical uncertainties were identified for either waste treatment or radiological concerns.

SRS is requesting SCDHEC/EPA to approve and permit the pretreatment requirements for the proposed treatment option for this waste stream. Budget and scheduling uncertainties may arise until regulatory approval is complete.

3.1H.5 Laboratory Waste with Tetraphenyl Borate

3.1H.5.1 GENERAL INFORMATION

Waste Stream Number: SR-W043

The preferred treatment option for the Laboratory Waste with Tetraphenyl Borate is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

This waste stream is laboratory waste, including filters, wipes, plastic and glassware, resulting from analytical testing activities. The lab waste is coated with tetraphenyl borate which degrades to form benzene.

Volume

- Current volume through 09/30/93 is 0.2 m³.
- Expected 1993-1997 volume will be 2.6 m³.

Waste Stream Composition

- Organic Debris

Waste Code

- D018 (TCLP benzene)

LDR Treatment Standard

- D018 = no treatment standard yet developed by EPA

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high.
- No TCLP on the waste stream but tetraphenyl borate likely fails TCLP for benzene because it degrades to form benzene.

Radiological Characterization

- Current inventory of waste was generated in an RMMA but not likely to contain contamination.
- Future waste streams will be radiologically contaminated.
- Waste is contact handled.
- Mixed low-level waste

3.1H.5.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. EPA has not developed treatment standards for benzene. Discussion in Federal Registers and EPA guidance and correspondence indicate that incineration technology will likely be the BDAT for benzene.

The CIF will have spare capacity to treat other SRS wastes in addition to the design basis waste streams. SRS mission changes have reduced the expected quantity of the design basis waste feeds. Newly identified wastes can replace some portion of the original design basis waste feeds immediately after CIF startup.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.1H.5.3 TREATMENT OPTION INFORMATION

Option Support Justification – IDOA Performed

- The preferred option technology is well known and demonstrated for organics. This technology is likely to be the BDAT for this waste code when one is developed by the EPA.
- Treatment of the waste stream using the preferred option will result in significant volume reduction and a waste form suitable for disposal without additional treatment.
- The preferred treatment option is an existing, onsite facility. Treatment of this waste stream at CIF will require no additional equipment or operating personnel.
- No additional permit actions will be needed to treat this waste stream at the CIF, resulting in a shorter time period for treating the waste, compared with other options.

From a regulatory standpoint, the LDRs do not presently address this waste stream. However, LDR requirements will eventually apply to this waste code. Since there are no treatment standards associated with the benzene waste code, any treatment method that addresses the hazard of concern for benzene will be a suitable treatment. Based on the properties of

benzene, it appears that incineration is appropriate for achieving the treatment standard. Additionally, benzene, when it occurs as a spent solvent (F005), has incineration as a BDAT.

This waste stream will continue to be generated at SRS as long as there is high-level waste to process. This waste stream is generated from quality control and quality assurance checks in the laboratory. The existing and projected volume of waste is small and should be able to be processed in the CIF without significant impact.

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, initial incineration provides organic contaminant destruction and proper volume reduction in preparation for stabilization of the metals in the waste stream.

Facility Status

The CIF is completely designed and as of June 30, 1994, construction is 80% complete. The facility is fully funded and is anticipated to have construction complete December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Technology

Discarded laboratory glassware will need to be crushed. The waste stream will need to be packaged in cardboard boxes (21" x 21") to meet CIF WAC.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF has received its RCRA Part B permit, which was effective on November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992, with an effective date of December 10, 1992. The NESHAP's construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed Finding of No Significant Impact (FONSI). The FONSI was issued by DOE-HQ in the December 23, 1992, Federal Register.

There are no significant permitting issues related to incineration of this waste at CIF. The waste code for this waste stream is covered in the RCRA Part B Permit Application submitted to SCDHEC for the CIF which presently under construction by authority of a RCRA Construction Permit.

Preparation for Operation

Construction is on schedule for the CIF. However, a pretreatment step to repackage the waste to meet the CIF WAC is required. Further detail on where this operation will be accomplished is being analyzed.

3.1H.5.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste. The estimated cost to treat this waste stream is less than \$100 thousand.

Uncertainty Issues

This technology is applicable for treating benzene, which is the hazardous constituent of the waste stream. However, the waste's characterization in relation to the CIF WAC has not been fully analyzed.

SRS is requesting SCDHEC to approve the proposed regulatory discretion in treatment option for this waste. Budget and scheduling uncertainties may arise until regulatory approval and permitting is final.

3.1H.6 Job Waste Containing Solvent Contaminated Wipes

3.1H.6.1 GENERAL INFORMATION

Waste Stream Number: SR-W055

The preferred treatment option for the Job Waste Containing Solvent Contaminated Wipes waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

This waste is sitewide operations generated job waste, including radiologically contaminated plastic huts, protective clothing, contaminated metal tools, glass, paper and cardboard which is suspected to have been mixed with solvent contaminated wipes. Job waste has been declared mixed waste according to the Mixture Rule. SRS has modified procedures and practices regarding solvent contaminated wipes generation and management to eliminate or substantially reduce this type of waste.

Volume

- Current volume through 09/30/93 is 951 m³.
- No future waste generation expected due to the solvent rag minimization program.

Waste Stream Matrix

- Organic Debris

Waste Code

- F001, F002, F003, F005A (halogenated and nonhalogenated spent solvents)

LDR Treatment Standard

- Concentration based standard = 0.75 mg/l-170 mg/kg except for 2-Ethoxyethanol, 2-Nitropropane-Incineration = specified technology
- Alternate debris technology may be applied

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium based on the use of process knowledge to characterize waste. Also, other waste in the waste stream may not actually be contaminated with solvents but are characterized as such, according to the Mixture Rule.

Radiological Characterization

- Beta/gamma emitter
- Waste is contact handled.
- Mixed low-level waste

3.1H.6.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. This waste stream meets the LDR definition for debris and can be treated by one of the debris technologies or it can be treated to the concentration based treatment standard. There are concentration based treatment standards for the F-listed waste codes in this waste stream. Because the waste stream is a nonwastewater, the required standards are total composition standards expressed in mg/kg. The substances which have standards listed in F001, F002, F003 and F005 waste codes range from 0.75 mg/kg to 170 mg/kg and the treatment of this waste stream in the CIF represents BDAT treatment and should result in compliance with the LDR regulation for the disposal of the treated waste stream. In addition, thermal destruction is an appropriate debris treatment technology.

The CIF will have spare capacity to treat other SRS wastes in addition to the design basis waste streams. SRS mission changes have reduced the expected quantity of the design basis waste feeds. Newly identified wastes can replace some portion of the original design basis waste feeds immediately after CIF startup.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates for the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

This is a large volume waste stream which must be phased into the treatment plan for utilization of the CIF. The waste must be repackaged to meet the CIF WAC and, at that time, any metal tools will be segregated and treated to meet the LDR alternative debris treatment technology.

3.1H.6.3 TREATMENT OPTION INFORMATION

Option Support Justification – IDOA Performed

- The preferred option technology is well known, demonstrated and represents technology capable of meeting LDR requirements. This technology is the BDAT for the waste codes listed in this waste stream.
- Treatment of the waste stream using the CIF will result in significant volume reduction and a waste form suitable for disposal without additional treatment.
- The preferred option is an existing, onsite facility. Treatment of this waste stream at the CIF will require no additional equipment or operating personnel.

- No additional permit actions will be needed to treat this waste stream at the CIF resulting in a shorter time period for treating the waste compared with other options.

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, initial incineration provides organic contaminant destruction and volume reduction in preparation for stabilization of the metals in the waste stream.

Facility Status

The CIF is completely designed and as of June 30, 1994, construction is 80% complete. The facility is fully funded and is anticipated to have construction complete December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Technology

Treatability demonstrations for this waste stream may or may not have to be conducted, depending on its similarity to the wastes the CIF was designed to handle.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP's construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed FONSI. The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

There are no significant permitting issues related to incineration of this waste at CIF. The waste codes for this waste stream are covered in the Part B Permit Application submitted to SCDHEC for the CIF which is presently under construction by authority of a RCRA permit.

Preparation for Operation

Construction is on schedule for the CIF. However, a pretreatment step to repackage the waste to meet the CIF WAC is required. Options for accomplishing this operation are being analyzed.

3.1H.6.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

Actual cost to treat the waste stream must be determined. CIF is not funded at present to treat this specific waste. This large volume waste stream is not likely to be handled by CIF until after the design basis wastes have been treated. Treating design basis wastes is expected to take three years.

The estimated cost to treat this waste stream is between \$7 million and \$17 million.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.1H.7 Job Waste with Enriched Uranium and Solvent Applicators

3.1H.7.1 GENERAL INFORMATION

Waste Stream Number: SR-W056

The preferred treatment option for the Job Waste with Enriched Uranium and Solvent Applicators is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

This waste stream is job wastes such as plastic huts, protective clothing, contaminated metal tools, glass bottles, paper, etc., that were declared hazardous due to the likelihood of being mixed with solvent contaminated rags. The waste is contaminated with enriched uranium from the Naval Fuels (NF) Facility, which is no longer operational.

Volume

- Current volume through 09/30/93 is 260 m³.
- No future waste generation expected because the NF manufacturing process which generated this waste is no longer operational.

Waste Stream Composition

- Organic debris

Waste Code

- FG01, F002, F003, F005A (halogenated and nonhalogenated spent solvents)

LDR Treatment Standard

- Concentration based standard = 0.75 mg/l-170 mg/kg except for 2-Ethoxyethanol, 2-Nitropropane-Incineration
- Alternative debris technology may be applied

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium based on the use of process knowledge to characterize waste and the use of the mixture rule, declaring low-level job control waste mixed if it was suspected that solvent wipes could have been placed in the box or drum.

Radiological Characterization

- The 90 cubic foot boxes contain 146-246 grams of U²³⁵.
- The 55 gallon drums contain 0-115 grams U²³⁵.
- This waste is contact handled.
- Mixed low-level waste

3.1H.7.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. This waste stream meets the LDR definition for debris and can be treated by one of the debris technologies or it can be treated to the concentration based treatment standard. There are concentration based treatment standards for the F-listed waste codes in this waste stream. Because the waste stream is a nonwastewater, the required standards are total composition standards expressed in mg/kg. The substances which have standards listed in F001, F002, F003 and F005 waste codes range from 0.75 to 170 mg/kg. The BDAT for these F-listed codes is incineration. The treatment of this waste stream in the CIF represents BDAT treatment and should result in compliance with the LDR regulation.

The CIF will have spare capacity to treat other SRS wastes in addition to the design basis waste streams. SRS mission changes have reduced the expected quantity of the design basis waste feeds. Newly identified wastes can replace some portion of the original design basis waste feeds immediately after CIF startup.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates for the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

This is a large volume waste stream which must be phased into the treatment plan for scheduled treatment at the CIF. The waste must be repackaged to meet the CIF WAC and, at that time, any metal tools will be segregated and treated using a LDR alternative debris treatment technology.

3.1H.7.3 TREATMENT OPTION AND SUPPORT DATA

Option Support Justification – IDOA Performed

- The preferred option technology is well known, demonstrated and represents technology capable of meeting LDR requirements. This technology is the BDAT for the waste codes listed in this waste stream.
- Treatment of the waste stream using the preferred option will result in significant volume reduction and a waste form suitable for disposal without additional treatment. Uranium contamination is expected to be well stabilized by the treatment train without the need for additional handling.
- The preferred option is an existing, onsite facility. Treatment of this waste stream at the preferred option will require no additional equipment or operating personnel.
- No additional permit actions will be needed to treat this waste stream at the CIF resulting in a shorter time period for treating the waste compared with other options.

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, initial incineration provides organic contaminant destruction and volume reduction in preparation for stabilization of the metals in the waste stream.

Facility Status

The CIF is completely designed and as of June 30, 1994, construction is 80% complete. The facility is fully funded and is anticipated to have construction complete December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Technology

Treatability demonstrations for this waste stream may or may not have to be conducted, depending on its similarity to the wastes the CIF was designed to handle.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF RCRA Part B permit was effective on November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992, and was effective December 10, 1992. The NESHAP's construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an Environmental Assessment was prepared for the CIF and a 60-day public comment period was held for the proposed Finding of No Significant Impact (FONSI). The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

There are no significant permitting issues related to incineration of this waste at CIF. The waste codes for this waste stream are covered in the RCRA Part B Permit Application submitted to SCDHEC for the CIF which is presently under construction by authority of a RCRA Construction Permit.

Preparation for Operation

Construction is on schedule for the CIF. However, a pretreatment step to repackage the waste to meet the CIF WAC is required. Further detail on where this operation will be accomplished is being analyzed.

3.1H.7.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

Actual cost to treat the waste stream must be determined. CIF is not funded at present to treat this specific waste. This large volume waste stream is not likely to be handled by CIF until after the design basis wastes have been treated. Treating design basis wastes is expected to take three years.

The estimated cost to treat this waste stream is included with the cost of SR-W055. The volume is so small compared to the volume of SR-W055 that the proportional share of the cost borne by SR-W056 is insignificant.

Uncertainty Issues

This technology is standard for treating the hazardous constituent(s) of the waste stream. However, the waste's radiation level in relation to the CIF WAC has not been fully analyzed.

No technical uncertainties were identified for either waste treatment or radiological concerns.

Section 3.11 Organic Liquids

3.11.1 Rad-Contaminated Solvents

3.11.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W001

The preferred treatment option for the Rad-Contaminated Solvents waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

This waste stream is radioactively contaminated solvent and solvent mixtures used for cleaning equipment in the Separations or Reactors Areas or used in laboratory procedures. The non-halogenated solvents in storage are wastes that used carbon (C^{14}) and tritium (H^3) labeled materials as tracers, or mixtures of waste scintillation counter calibration standards. The halogenated solvents are degreasing solvents contaminated with tritium. This waste stream was identified in the Interim MWIR (4/93) as Radioactive Trichloroethane.

Volume

- Current volume through 09/30/93 is 0.4 m³.
- Expected 1993-1997 volume will be 2.0 m³.

Waste Stream Composition

- Organic Liquid

Waste Code

- D001A (ignitable high TOC), F001, F002, F003, F005 (halogenated and nonhalogenated spent solvents), D018 (benzene)

LDR Treatment Standard

- D001 = specified technology – Fuel Substitution, Recovery of Organics, or Incineration
- D018 – No treatment standard yet developed by EPA
- F001-F003, F005A = concentration based standards – 0.75 mg/l-170 mg/l except F005A 2-Ethoxyethanol, 2-Nitropropane = Incineration

Waste Characterization

- Process knowledge used to characterize waste stream.
- Confidence level is high based upon the known composition of the solvents used in the processes.

Radiological Characterization

- Sampling and analysis results indicate total activity for tritium as 2.9 nCi/g.
- Waste is contact handled.
- Mixed low-level waste

3.11.1.2 TECHNOLOGY AND CAPACITY NEEDS

Waste code D001A has a specified technology for high total organic carbon (TOC) non-wastewaters of Fuel Substitution, Recovery of Organics or Incineration. The LDR requirements for waste codes F001, F002, F003 and F005 are concentration based standards. These concentrations range from 0.75-170 mg/kg. No treatment standard has yet been developed by the EPA for benzene.

Utilization of the CIF for the treatment of this waste stream represents BDAT treatment for all the waste codes which have an established BDAT. Incineration has an established record of success in meeting the imposed treatment standards for the waste codes listed in this waste stream.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.11.1.3 TREATMENT OPTION INFORMATION

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, incineration provides organic contaminant destruction and proper volume reduction.

This waste stream is one of the target waste streams on which the design of the CIF is based. Continuing action has been taken to reduce the volume of this waste stream through the use of nondisposable, recyclable applicators, and the use of nonhazardous solvent substitutes.

The CIF Mission Need and Design Capacity Review (7/7/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 7/29/93) re-evaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to re-examine the appropriateness of each Functional Performance Requirement (FPR) design basis waste group. The FPR is an initial engineering design document that defines the scope of the design project and serves as a baseline for subsequent project design work. The review included additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to FPR (nonradioactive) waste groups that were addressed in the FPR. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA LDR requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Facility Status

The CIF is completely designed and as of June 30, 1994 construction was 80% complete. The facility is fully funded and anticipated to have construction complete by December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed FONSI. The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

This waste stream is covered in the RCRA Part B Permit application submitted to SCDHEC for the Consolidated Incineration Facility (CIF) which is presently under construction by authority of a RCRA permit.

Preparation for Operation

Construction is on schedule for the CIF.

3.11.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

The estimated cost to treat this waste stream, including waste streams SR-W002, SR-W003, SR-W010, SR-W012, SR-W022, SR-W030, SR-W035, and stabilizing resulting ash and blowdown liquid, is between \$100 million and \$135 million.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.11.2 Rad-Contaminated Chlorofluorocarbons

3.11.2.1 GENERAL INFORMATION

Waste Stream Number: SR-W002

The preferred treatment option for the Rad-Contaminated Chlorofluorocarbons waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

This waste consists of chlorofluorocarbon solvents (Freon 113 and Trichlorotrifluoroethane) and degreasing solvents for depleted uranium fines used to assure unhindered adsorption of water in the tritium process. This waste stream also was identified as Radioactive Freon 113 in the Interim MWIR (4/93).

Volume

- Current volume through 09/30/93 1.0 m³.
- Expected 1993-1997 volume will be 3.0 m³.

Waste Stream Composition

- Organic Liquid

Waste Code

- F001 (spent chlorofluorocarbon solvents), F002 (1,1,2 trichloro 1,2,2 trifluoroethane), D019 (carbon tetrachloride), D022 (chloroform)

LDR Treatment Standard

- F-listed = concentration based standard – 5.6-33 mg/kg
- D019 and D022 = no treatment standard yet developed by EPA

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based upon known composition of the solvents used in the processes.

Radiological Characterization

- Sampling and analysis results indicate total activity as 0.3 nCi/g.
- Waste stream is alpha (U²³⁸) and beta/gamma emitter.
- Tritium also is present.
- Waste is contact handled.
- Mixed low-level waste

3.11.2.2 TECHNOLOGY AND CAPACITY NEEDS

The LDR regulations have established concentration based treatment standards for these F-listed wastes. The specific standards are: F001 (spent halogenated solvents) = 5.6 mg/kg to 33 mg/kg depending on the contaminant, F002 (1,1,2 trichloro 1,2,2 trifluoroethane) = 28mg/kg. No BDAT, specified technology, or treatment standard has been developed by the EPA for benzene or chloroform waste codes. Utilization of the CIF for the treatment of this waste stream represents BDAT treatment for all the waste codes which have an established BDAT. Incineration has an established record of success in meeting the imposed treatment standards for the waste codes listed in this waste stream.

This waste stream is one of the target waste streams on which the design of the CIF is based.

The capacity limiting CIF subsystem is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.11.2.3 TREATMENT OPTION INFORMATION

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, incineration provides organic contaminant destruction and proper volume reduction.

The CIF Mission Need and Design Capacity Review (7/7/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 7/29/93) re-evaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to re-examine the appropriateness of each Functional Performance Requirement (FPR) design basis waste group. The FPR is an initial engineering design document that defines the scope of the design project and serves as a baseline for subsequent project design work. The review included additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to FPR nonradioactive waste groups that were addressed in the FPR. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA LDR requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Facility Status

The CIF is completely designed and as of June 30, 1994 construction was 80% complete. The facility is fully funded and anticipated to have construction complete by December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed FONSI. The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

This waste stream is covered in the RCRA Part B Permit application submitted to SCDHEC for the Consolidated Incineration Facility (CIF), which is presently under construction by authority of a RCRA permit.

Preparation for Operation

Construction is on schedule for the CIF.

3.11.2.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

The estimated cost to treat this waste stream is included with the cost of SR-W001.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.11.3 Scintillation Solution

3.11.3.1 GENERAL INFORMATION

Waste Stream Number: SR-W010

The preferred treatment option for the Scintillation Solution waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

Organic solution used in bioassay analysis by analytical laboratories at the SRTC.
Nonhazardous substitutes are now being used and this waste is no longer generated.

Volume

- Current volume through 09/30/93 is 3.6 m³.
- No future waste generation expected because a nonhazardous scintillation organic was identified and substituted into the laboratory procedure.

Waste Stream Composition

- Organic Liquid

Waste Code

- D001A (ignitable high TOC), F003 (xylene), F005A (toluene), D018 (benzene) spent solvent, nonwastewater

LDR Treatment Standard

- D001A = specified technology – Fuel Substitution, Recovery of Organics, or Incineration
- F003 and F005A = concentration based standards = 0.75 mg/l-170 mg/l except F005A 2-Ethoxyethanol, 2-Nitropropane = Incineration
- D018 = no treatment standard yet developed by EPA

Waste Characterization

- Process knowledge was used to characterize the waste stream.
- Confidence level is high due to knowledge of the laboratory process and the use of mass balance.

Radiological Characterization

- Tritium and beta/gamma emitters.
- Waste is contact handled.
- Mixed low-level waste

3.11.3.2 TECHNOLOGY AND CAPACITY NEEDS

Waste code D001A has a specified technologies for: 1) Fuel Substitution, 2) Recovery of Organics, or 3) Incineration. Land disposal restriction regulations have established concentration based treatment standards for the F-listed solvents. The standards are 28 mg/kg for total xylenes (F003) and 28 mg/kg for the toluene (F005A). No treatment standard has yet been developed by the EPA for benzene. Utilization of the Consolidated Incineration Facility for the treatment of this waste stream represents BDAT treatment for all the waste codes which have an established treatment standard. Incineration has an established record of success in meeting the imposed treatment standards for the waste codes listed in this waste stream.

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This waste stream is one of the target waste streams on which the design on the Consolidated Incineration facility is based. Continuing action has been taken to reduce the volume of this waste stream through the use of nonhazardous solvent substitutes.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.11.3.3 TREATMENT OPTION INFORMATION

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, incineration provides organic contaminant destruction and proper volume reduction.

The CIF Mission Need and Design Capacity Review (7/7/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 7/29/93) re-evaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to re-examine the appropriateness of each Functional Performance Requirement (FPR) design basis waste group. The FPR is an initial engineering design document that defines the scope of the design project and serves as a baseline for subsequent project design work. The review included additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to FPR nonradioactive waste groups that were addressed in the FPR. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA LDR requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Facility Status

The CIF is completely designed and as of June 30, 1994 construction was 80% complete. The facility is fully funded and anticipated to have construction complete by December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed FONSI. The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

This waste stream is covered in the RCRA Part B Permit application submitted to SCDHEC for the CIF, which is presently under construction by authority of a RCRA construction permit.

Preparation for Operation

Construction is on schedule for the CIF.

3.11.3.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

The estimated cost to treat this waste stream is included with the cost of SR-W001.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.11.4 Defense Waste Processing Facility (DWPF) Benzene

3.114.1 GENERAL INFORMATION

Waste Stream Number: SR-W022

The preferred treatment option for the Defense Waste Processing Facility Benzene waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

A future waste stream generated from DWPF operations to vitrify high-level waste. Prior to introduction into the vitrification process, feed chemicals containing tetraphenyl borate react with the waste precipitate slurry to remove unwanted radiological constituents. The reaction between the precipitate slurry and the process feed chemicals within the precipitate reactor will liberate benzene from the slurry. The tetraphenyl borate compounds will decompose in the presence of formic acid and copper catalyst to form boric acid, formate salts, and organics (primarily benzene). This offgas will be condensed and transferred to the Organic Waste Storage Tank (OWST). The OWST is solely a storage and transfer facility; no treatment of the benzene occurs in the tank.

This waste stream consists of essentially 100% organic substances, with only incidental carry-over of aqueous material. The organic stream, which is primarily benzene (80%-95%), also is composed of biphenyl, diphenylamine, phenol, and diphenylmercury (~5%-20% combined total). The benzene is contaminated with radioactive cesium and mercury. The primary radiological contaminant is cesium since cesium is a fairly volatile metal.

Volume

- Expected 1993-1997 volume is 380 m³.

Waste Stream Composition

- Organic Liquid

Waste Code

- D001A (ignitable high TOC), D009A (TCLP Hg), D018 (benzene)

LDR Treatment Standard

- D001A = Specified Technology – Fuel Substitution, Recovery of Organics, or Incineration
- D009A = Concentration based standard – 0.2 mg/l
- D018 = no treatment standard yet developed by EPA

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based on the availability of analysis on pilot feed stream.
- Typical contaminant levels are 15-120 mg/l Hg, benzene ≈ 80%-95% of organic waste stream

Radiological Characterization

- Presence of beta/gamma emitters.
- Waste is contact handled.
- Mixed low-level waste

3.11.4.2 TECHNOLOGY AND CAPACITY NEEDS

The waste code D001A has a specified technology of Fuel Substitution, Recovery of Organics, or Incineration. The D009 waste code carries a treatment standard of 0.2 mg/l as determined

by the TCLP test. No treatment standard has yet been developed by the EPA for benzene. Utilization of the CIF for the treatment of this waste stream represents BDAT treatment for all the waste codes which have an established treatment standard. Incineration has an established record of success in meeting the imposed treatment standards for the waste codes listed in this waste stream.

This waste stream is one of the target waste streams on which the design on the CIF is based.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates for the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.11.4.3 TREATMENT OPTION INFORMATION

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, incineration provides organic contaminant destruction and proper volume reduction.

The CIF Mission Need and Design Capacity Review (7/7/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 7/29/93) re-evaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to re-examine the appropriateness of each Functional Performance Requirement (FPR) design basis waste group. The FPR is an initial engineering design document that defines the scope of the design project and serves as a baseline for subsequent project design work. The review included additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to FPR nonradioactive waste groups that were addressed in the FPR. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA LDR requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Facility Status

The CIF is completely designed and as of June 30, 1994 construction was 80% complete. The facility is fully funded and anticipated to have construction complete by December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed FONSI. The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

This waste stream is covered in the RCRA Part B Permit application submitted to SCDHEC for the CIF, which is presently under construction by authority of a RCRA construction permit.

Preparation for Operation

Construction is on schedule for the CIF.

3.11.4.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

The estimated cost to treat this waste stream is included with the cost of SR-W001.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.11.5 Spent Methanol Solution

3.11.5.1 GENERAL INFORMATION

The preferred treatment option for the Spent Methanol waste stream is Incineration in the Consolidated Incineration Facility.

Waste Stream Number: SR-W030

Background Information:

This waste stream was generated in a classified operation at the now closed Naval Fuels (NF) Facility.

Volume

- Current volume through 09/30/93 is 0.2 m³.
- No future waste generation expected because manufacturing process (NF) which generated this waste is no longer operational.

Waste Stream Composition

- Organic Liquid

Waste Code

- D001A (ignitable high TOC), D006A (TCLP Cd), D010A (TCLP Se) nonwastewater

LDR Treatment Standard

- D001A = Specified Technology – Fuel Substitution, Recovery of Organics, or Incineration
- D006A, D010A – concentration based standard – 1.0 - 5.7 mg/l

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high because of analysis availability.

Radiological Characterization

- Typical activity is 16.4 nCi/g
- Alpha emitter is U²³⁵.
- Waste is contact handled.
- Mixed low-level waste

3.11.5.2 TECHNOLOGY AND CAPACITY NEEDS

The waste code D001A has specified technologies for: 1) Fuel Substitution, 2) Recovery of Organics, or 3) Incineration. The D006 and D010 waste codes have a concentration based treatment standards determined by TCLP test. Utilization of the CIF for the treatment of this waste stream represents the specified technology for D001. Further, the metals will be treated in the ashcrete process through stabilization.

This waste stream is one of the target waste streams on which the design of the Consolidated Incineration facility is based. This waste stream was generated in the Naval Fuels Facility, which is now closed. No future generation is anticipated.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates for the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.11.5.3 TREATMENT OPTION INFORMATION

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, initial incineration provides organic contaminant destruction and proper volume reduction.

The CIF Mission Need and Design Capacity Review (7/7/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 7/29/93) re-evaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to re-examine the appropriateness of each Functional Performance Requirement (FPR) design basis waste group. The FPR is an initial engineering design document that defines the scope of the design project and serves as a baseline for subsequent project design work. The review included additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to FPR nonradioactive waste groups that were addressed in the FPR. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA LDR requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Facility Status

The CIF is completely designed and as of June 30, 1994 construction was 80% complete. The facility is fully funded and anticipated to have construction complete by December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed FONSI. The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

This waste stream is covered in the RCRA Part B Permit application submitted to SCDHEC for the CIF, which is presently under construction by authority of a RCRA construction permit.

Preparation for Operation

Construction is on schedule for the CIF.

3.11.5.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

The estimated cost to treat this waste stream is included with the cost of SR-W001.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.11.6 Freon 11/Oil

3.11.6.1 GENERAL INFORMATION

Waste Stream Number: SR-W035

The preferred treatment option for the Freon 11/Oil waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

Waste generated from a preventative maintenance program for changing the refrigeration oil in some of the Separations Area chillers. Routinely, this is a nonradioactive used oil that could be recycled for energy recovery. However, these nine drums had detectable levels of tritium (H^3) which prevented recycling. Contaminants in the Freon (D019, D039, D040) also have been determined to make the Freon 11/Oil hazardous. Therefore, the waste is characterized as mixed waste.

Volume

- Current volume through 09/30/93 is 2.0 m³.
- No future waste generation is expected because this was a one time generation.

Waste Stream Composition

- Organic Liquid

Waste Code

- D019 (carbon tetrachloride), D022 (chloroform), D039 (tetrachloroethylene), D040 (trichloroethylene)

LDR Treatment Standard

- No treatment standards yet developed by EPA for these D-codes.

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high because of TCLP results.
- TCLP has been run on nonradioactive Freon 11 but not on radioactive Freon 11.

Radiological Characterization

- Typical activity is 8.75×10^{-2} nCi/g.
- Tritium present in waste stream.
- Waste is contact handled.
- Mixed low-level waste

3.11.6.2 TECHNOLOGY AND CAPACITY NEEDS

There have been no treatment standards developed at this time by EPA for any of the waste codes listed for this waste stream. From a regulatory standpoint, the LDRs do not address this waste stream at the present time. However, LDR requirements will eventually apply to these waste codes. From reviewing EPA's past actions in dealing with these organics as components of listed solvent waste streams, it appears likely that incineration will be named the BDAT for the newly identified characteristic organics.

This waste stream is one of the target waste streams on which the design of the CIF is based.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste

treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.11.6.3 TREATMENT OPTION INFORMATION

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, incineration provides organic contaminant destruction and proper volume reduction.

The CIF Mission Need and Design Capacity Review (7/7/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 7/29/93) re-evaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to re-examine the appropriateness of each Functional Performance Requirement (FPR) design basis waste group. The FPR is an initial engineering design document that defines the scope of the design project and serves as a baseline for subsequent project design work. The review included additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to FPR nonradioactive waste groups that were addressed in the FPR. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA LDR requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Facility Status

The CIF is completely designed and as of June 30, 1994 construction was 80% complete. The facility is fully funded and anticipated to have construction complete by December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter of FY96.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed FONSI. The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

This waste stream is covered in the RCRA Part B Permit application submitted to SCDHEC for the CIF, which is presently under construction by authority of a RCRA construction permit.

Preparation for Operation

Construction is on schedule for the CIF.

3.11.6.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

The estimated cost to treat this waste stream is included with the cost of SR-W001.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

3.11.7 Tributyl Phosphate and n-Paraffin

3.11.7.1 GENERAL INFORMATION

Waste Stream Number: SR-W045

The preferred treatment option for the Tributyl Phosphate and n-Paraffin is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

An organic solvent generated in the Plutonium/Uranium Extraction Process (PUREX) used in the Separations areas. During the SRS DSTP process, the program to consolidate waste streams SR-W044 Tributyl Phosphate and n-Paraffin (TRU) with SR-W045 was completed. These waste streams will be reported as SR-W045.

Volume

- Current volume through 09/30/93 is 107 m³.
- No future waste generation expected because changes to solvent extraction practices in canyon separations process should no longer have degenerated solvent being RCRA hazardous (just LLW). Do not expect future generation because of process modifications, product substitutions, etc.

Waste Stream Composition

- Organic Liquid

Waste Code

- D008A (TCLP Pb), D009A (TCLP Hg), D011A (TCLP Ag), D018 (benzene), D040 (trichloroethylene) nonwastewater

LDR Treatment Standard

- D008, D009, D011 = concentration based standard = 0.2 - 5.0 mg/l
- D018, D040 = no treatment standard yet developed by EPA

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high because sampling and analysis is available.

Radiological Characterization

- Total activity ranges 8-16 nCi/g.
- Cm²⁴⁴, Am²⁴¹, Pu²³⁹, Eu¹⁵⁴, Eu¹⁵⁵, Pu²³⁸, and lesser amounts of Zr⁹⁵, Sb¹²⁵, Cs¹³⁷, Co⁶⁰.
- Waste is contact handled.
- Mixed low-level waste

3.11.7.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. The three codes identifying the metals all have concentration based standards which are determined by TCLP test results. The treatment standard for each metal is:

- D008 lead (Pb) = 5.0 mg/l,
- D009 mercury (Hg) = 0.2 mg/l,
- D011 silver (Ag) = 5.0 mg/l
- There are no specified technologies or treatment standards developed at this time for the two characteristic organic chemicals, D018 and D040.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.11.7.3 TREATMENT OPTION INFORMATION

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, incineration provides organic contaminant destruction and proper volume reduction.

This is a large volume waste stream which must be phased into the treatment plan for utilization of the CIF. Due to the high alpha activity displayed by this waste stream, it will be necessary to blend with other lower activity streams rather than incinerate directly. An alternative to the blending process is a pretreatment step of removing a major portion of the radioactivity via an adsorption column prior to treatment.

The CIF Mission Need and Design Capacity Review (7/7/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 7/29/93) re-evaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to re-examine the appropriateness of each Functional Performance Requirement (FPR) design basis waste group. The FPR is an initial engineering design document that defines the scope of the design project and serves as a baseline for subsequent project design work. The review included additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to FPR nonradioactive waste groups that were addressed in the FPR. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA LDR requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Option Support Justification – IDOA Performed

- The preferred option technology is well known, demonstrated and represents technology capable of meeting LDR requirements. This treatment train represents the best method to adequately treat all the waste codes in this waste stream to meet LDR standards.
- Treatment of the waste stream using the preferred option will result in significant volume reduction and a waste form suitable for disposal without additional treatment.
- The preferred option is an existing, onsite facility. Treatment of this waste stream at the preferred option will require no additional equipment or operating personnel.
- No additional permit actions will be needed to treat this waste stream at the preferred option which could result in faster treatment times.

Facility Status

The CIF is completely designed and as of June 30, 1994, construction is 80% complete. The facility is fully funded and is anticipated to have construction complete December 31, 1995. Start date to treat mixed waste is anticipated to be second quarter FY96.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF is RCRA Part B permit, became effective on November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992, and was effective December 10, 1992. The NESHAP's construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed Finding of No Significant Impact (FONSI). The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

There are no expected permitting issues related to incineration of this waste at CIF. The waste codes for this waste stream are covered in the RCRA Part B Permit Application submitted to SCDHEC for the CIF which is presently under construction by authority of a RCRA Construction Permit.

Preparation for Operation

Construction is on schedule for the CIF. However, a blending or pretreatment program to reduce the radionuclide content of this waste stream needs to be developed and approved.

3.11.7.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

CIF is not funded at present to treat this specific waste. This large volume waste stream is not likely to be handled by CIF until after the design basis wastes have been treated. This is expected to take three years.

The estimated cost to treat this waste stream is less than \$150 thousand.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, except for pretreatment decisions on the waste to reduce the radioactivity of the stream to meet the CIF's WAC concerning radioactivity.

3.11.8 Tetrabutyl Titanate (TBT)

3.11.8.1 GENERAL INFORMATION

Waste Stream Number: SR-W059

The preferred treatment option for the Tetrabutyl Titanate waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

This organic liquid was used as a catalyst in the Beta/Gamma Incinerator in H-Area. When the incinerator was shut down, excess material could not be used elsewhere onsite or returned to the vendor. It was declared a hazardous waste due to TBT degrading to ignitable butanol. Prior to shipping the waste for offsite treatment, all of the drums underwent radiological screening in which four drums showed detectable levels of tritium (H^3). These four drums were separated from the rest and declare mixed waste.

Volume

- Current volume through 09/30/93 is 0.8 m³.
- No future waste generation expected because excess material is from the Beta/Gamma Incinerator which is no longer operating.

Waste Stream Composition

- Organic liquid

Waste Code

- D001A (ignitable, high TOC)

LDR Treatment Standard

- Specified technology = Fuel Substitution, Recovery of Organics, or Incineration

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high since this is technical grade tetrabutyl titanate which degrades to butanol (ignitable).

Radiological Characterization

- Typical activity of tritium is 1.5 nCi/g.
- Tritium detection is suspect (may be a false detection) but the site is handling it as mixed waste until additional analysis may be scheduled to verify first analysis.
- Waste is contact handled.
- Mixed low-level waste

3.11.8.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. The waste code D001 has as specified technologies: 1) Fuel Substitution, 2) Recovery of Organics, or 3) Incineration. Utilization of the Consolidated Incineration Facility for the treatment of this waste stream represents the specified technology for treatment for a D001 waste code. There is a question as to the tritium analysis rendering a false positive result. A request to resample and reanalyze the drums has been made, but no results are yet available. If resampling verifies the false positive for tritium, the waste will be reclassified as hazardous waste only.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

This is a small volume, one time waste generation which should be able to be successfully handled by the CIF with little impact.

3.11.8.3 TREATMENT OPTION INFORMATION

Thermal destruction of this waste in the CIF followed by stabilization in the ashcrete process provides a treatment that is capable of meeting the treatment standards for the waste codes found in this waste stream. Since the waste is highly organic, incineration provides organic contaminant destruction and proper volume reduction.

The CIF Mission Need and Design Capacity Review (7/7/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 7/29/93) re-evaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to re-examine the appropriateness of each Functional Performance Requirement (FPR) design basis waste group. The FPR is an initial engineering design document that defines the scope of the design project and serves as a baseline for subsequent project design work. The review included additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to FPR nonradioactive waste groups that were addressed in the FPR. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA LDR requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Option Support Justification – IDOA Performed

- The preferred option technology is well known, demonstrated and represents technology capable of meeting LDR requirements. This technology is the specified technology for the waste code listed in this waste stream.
- Treatment of the waste stream using the preferred option will result in significant volume reduction of at least 8:1 and a waste form suitable for disposal without additional treatment.
- The preferred option is an existing, onsite facility. Treatment of this waste stream at the preferred option will require no additional equipment or operating personnel.
- No additional permit actions may be needed to treat this waste stream at the preferred option which could result in faster treatment times.

Facility Status

The CIF is completely designed and as of June 30, 1994, construction is 80% complete. The facility is fully funded and is anticipated to have construction complete December 31, 1995. Start date to treat mixed waste is anticipated to be February 1996.

Technology

Treatability demonstrations for this waste stream may or may not have to be conducted, depending on its similarity to the wastes the CIF was designed to handle.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit, the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992, the effective date was December 10, 1992. The NESHAP's construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an Environmental Assessment was prepared for the CIF and a 60-day public comment period was held for the proposed Finding of No Significant Impact (FONSI). The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

There are no expected permitting issue related to the incineration of this waste at CIF. The waste code for this waste stream is covered in the RCRA Part B Permit Application submitted to SCDHEC for the CIF, which is presently under construction by authority of a RCRA Construction Permit.

Preparation for Operation

Construction is on schedule for the CIF. However, a pretreatment step to repackage the waste to meet the CIF WAC is required. Further detail on where this operation will be accomplished is being analyzed.

3.11.8.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

The estimated cost to treat this waste stream is less than \$250 thousand.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated at this time for this waste stream.

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Section 3.1/ Organic Sludges and Particulates

3.1).1 Paints and Thinners

3.1).1.1 GENERAL INFORMATION

Waste Stream Number: SR-W042

The preferred treatment option for the Paints and Thinners waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Background Information:

This waste stream consists of radioactively contaminated, off-specification waste paint, spent paint solvents, and paint chips from paint removal activities.

Volume

- Current volume through 09/30/93 is 5.3 m³.
- Expected 1993-1997 volume will be 5.0 m³.

Waste Stream Composition

- Organic Sludge/Particulate

Waste Code

- D001A (ignitable high TOC), D005A (TCLP Ba), D006A (TCLP Cd), D007A (TCLP Cr), D008A (TCLP Pb), D009A (TCLP Hg), D011A (TCLP Ag), D018 (benzene), D035 (methylethylketone), D038 (pyridine), F003 (xylene, acetone), F005A (nonhalogenated spent solvents)

LDR Treatment Standard

- D001A specified technology = Fuel Substitution, Recovery of Organics, or Incineration
- D005-D009, D011, F003, F005A concentration based standards = 0.2 mg/l-170 mg/kg except F005A 2-Ethoxyethanol, 2-Nitropropane = Incineration
- D018, D035, D038 = no treatment standard yet developed by EPA

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high because sample and analysis available.

Radiological Characterization

- Total activity is 0.45 nCi/g.
- Waste is contact handled.
- Mixed low-level waste

3.1J.1.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. The waste code D001 has as specified technology Fuel Substitution, Recovery of Organics or Incineration. The remaining waste codes are concentration based standards. The characteristic metals all have concentration based standards which are determined by TCLP test results. The F-listed waste codes also have concentration based treatment standards determined by total concentration. There are no specified technologies, or treatment standards developed at this time for any of the characteristic organic chemicals D018, D035, or D038.

The capacity limiting CIF subsystem for the entire CIF is the ashcrete unit. The ashcrete unit will have spare capacity even with the proposed addition of CIF blowdown. However, waste treatment rates at the CIF must be established so that volumes of ash and blowdown do not exceed the operating capacity of the ashcrete unit.

3.1J.1.3 TREATMENT OPTION INFORMATION

The CIF is made up of two distinct treatment processes, thermal destruction and stabilization of the resulting residues. This waste stream, with mainly an organic fraction, but also with metal contaminants is well suited to the treatment train provided by the CIF. The organic portion of the waste will be destroyed, metal will be captured in the residues from the incineration process and will be stabilized in the ashcrete process. This treatment train is well developed and demonstrated for similar waste streams.

Option Support Justification – IDOA Performed

- The waste stream is similar to waste used as the design basis for the preferred option.
- The technology is well known and accepted as capable of meeting LDR standards.

- Treatment train represents best method for properly treating waste codes in this waste stream with minimum handling and worker exposure.
- Treatment utilizing the preferred option will result in significant volume reduction and produce a waste form suitable for disposal without additional treatment.
- The treatment option is an existing, onsite facility and will require no additional equipment or personnel to treat this waste stream.

Facility Status

The CIF is completely designed and as of June 30, 1994, construction is 80% complete. The facility is fully funded and is anticipated to have construction complete December 31, 1995. Start date to treat mixed waste is anticipated to be Second quarter FY96.

Technology

Treatability demonstrations for this waste stream may or may not have to be conducted, depending on its similarity to the wastes the CIF was designed to handle.

Regulatory Status

The major permits required for this treatment facility are:

- a. RCRA Part B Permit
- b. NESHAP for radionuclides and benzene
- c. SCDHEC Air Quality Permit for process emissions

The CIF received its RCRA Part B permit; the effective date was November 2, 1992. The Air Quality Construction Permit was issued on November 25, 1992; the effective date was December 10, 1992. The NESHAP construction permit for radionuclides was received on June 14, 1989; the NESHAP exemption for benzene emissions was received on August 18, 1989. Under the NEPA process, an EA was prepared for the CIF and a 60-day public comment period was held for the proposed FONSI. The FONSI was issued by DOE-HQ in the December 23, 1992 Federal Register.

There are no expected permitting issues related to incineration of this waste at CIF. The waste codes in this waste stream are covered in the RCRA Part B Permit Application submitted to SCDHEC for the CIF, which is presently under construction by authority of a RCRA permit.

Preparation for Operation

Construction is on schedule for the CIF. However, a pretreatment step to repackage the waste to meet the CIF WAC is required. Further detail on where this operation will be accomplished is being analyzed.

3.1J.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Operating budget funds will be used to finance the treatment of this waste.

The estimated cost to treat this waste stream is between \$3 million and \$6 million.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream, at this time.

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Section 3.1K Reactive Metals

3.1K.1 Calcium Metal

3.1K.1.1 GENERAL INFORMATION

Waste Stream Number: **SR-W034**

The preferred treatment option for the Calcium Metal waste stream is Wet Oxidation in an onsite containment building with further treatment at the F- & H- Effluent Treatment Facility (ETF).

Background Information:

Material that is used in an FB-Line process and became slightly oxidized and off-specification. The waste is stored in four 55 gallon steel drums.

Volume

- Current volume through 09/30/93 is 0.8 m³.
- No future waste generation expected. Off-specification material was stored in an RMMA before it was discovered the material was unacceptable to use for its specified purpose. Current procedures for material handling has reduced the likelihood for this situation to recur.

Waste Stream Composition

- Reactive Metal

Waste Code

- D003D (water reactive) nonwastewater

LDR Treatment Standard

- Specified technology = Deactivation
- Alternate debris technology may be applied.

Waste Characterization

- Process knowledge was used to characterize the waste stream.
- Confidence level is high based on the fact that this is pure technical grade calcium metal.

Radiological Characterization

- Stored in an RMMA – not likely to be contaminated but confirmation difficult.
- Waste is contact handled.
- Mixed low-level waste

3.1K.1.2 TECHNOLOGY AND CAPACITY NEEDS

This process flowsheet for the preferred option is shown above. This waste stream qualifies as debris. It can be treated by one of the 17 debris technologies or to the technology required for reactive waste. The non-debris treatment standard for this waste stream is the specified technology of deactivation. Deactivation is simply defined as removal of the hazardous characteristic from the waste.

3.1K.1.3 TREATMENT OPTION INFORMATION

Treatment of this waste stream in an onsite containment building requires compliance with 40 CFR Part 264 or 265 Subpart DD of the RCRA regulations. SRS intends to request a modification of its RCRA Part A Permit Application in order to treat this waste stream.

Option Support Justification – IDOA Performed

- The preferred option employs a simple, easily controlled chemical reaction that represents existing, well known technology
- The preferred option results in a significant reduction in waste stream volume from which the hazardous characteristic is removed allowing straight forward disposal. Liquid portion of treated waste acceptable for discharge through wastewater treatment facility.

Facility Status

A containment building uses a facility or part of a building which meets the design parameters set forth in 40 CFR Part 264 or Part 265, Subpart DD; to treat or store hazardous waste. This facility would have to be granted Interim Status and have the appropriate equipment. Candidate facilities have been identified, but selection of the specific building has not been made.

Technology

Controlled wet oxidation is an acceptable treatment for reactive metals and meets the LDR treatment standard of removing the reactive characteristic from the waste.

Regulatory Status

Once design is complete and a building is selected and determined to meet the design parameters, a modification to the RCRA Part A Permit Application would be made, along with the justification and capacity of waste the facility would treat.

Preparation for Operation

Besides the conditions listed under Facility Status, a Waste Analysis Plan, operational procedures, a log book including compliance and inspection plans, and appropriate training would have to be completed.

3.1K.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Presently there is no funding allocation for the treatment of this waste stream. Development of line item funding will be required before treatment of this waste stream can be performed.

The estimated cost to treat this waste stream is between \$1 million and \$2.3 million.

Uncertainty Issues

The small capacity of the calcium metal waste to be treated makes the treatment option uncertain with respect to the DOE budget due to the high costs to treat such a small quantity. Evaluation of similar waste streams complex wide may render a more cost effective treatment of consolidated waste. Concurrently, an exemption to DOE Order 6430.1A on a case-by-case basis would significantly decrease the cost to treat this waste in an existing building under the Containment Building option. SRS is requesting SCDHEC/EPA to approve the modification to the RCRA Part A Permit Application in treating this waste. Budget and scheduling uncertainties may arise without regulatory relief.

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Section 3.1L Soils

3.1L.1 Waste Sites / Spill Site Soil

3.1L.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W048

The preferred treatment option for the Waste Sites/Spill Site Soil waste stream is Vitrification in the M-Area Vendor Treatment Process.

Background Information:

This waste consists of soils, sand, and associated debris (rocks, wood, etc.) resulting from cleanup activities of spills and remedial actions.

Volume

- Current volume through 09/30/93 is 18.2 m³.
- No future waste generation expected.

Waste Stream Composition

- Uncategorized soils

Waste Code

- D004A through D011A (TCLP metals)
- D012 through D0041 (characteristic organics)

LDR Treatment Standard

- D004A-D011A concentration based standard = 0.2 mg/l-100 mg/l
- D012 – D017 concentration based standards = 0.066 – 10 mg/kg
- D018 – D043 = no treatment standard yet developed by EPA

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based on process knowledge of what was spilled or located at a particular site.

Radiological Characterization

- Beta/Gamma and Alpha emitter.
- Waste is contact handled.
- Mixed low-level waste

3.1L.1.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. EPA has committed to promulgating separate LDR treatment standards for soils because soils differ significantly from other waste. EPA has stated that treatment technologies and treatment standards set for other waste matrices are not appropriate for soils. However, if soils are treated prior to EPA standards for soils being promulgated, the soils would need to be treated to the levels noted below or the site would seek a treatability variance.

- D004 (Arsenic - As) = 5.0 mg/l,
- D005 (Barium - Ba) = 100 mg/l,
- D006 (Cadmium - Cd) = 1.0 mg/l,
- D007 (Chromium - Cr) = 5.0 mg/l,
- D008 (Lead - Pb) = 5.0 mg/l,
- D009 (Mercury - Hg) = 0.2 mg/l,
- D010 (Selenium - Se) = 5.7 mg/l,
- D011 (Silver - Ag) = 5.0 mg/kg,
- D012 (Endrin) = 0.13 mg/kg,
- D013 (Lindane) = 0.066 mg/kg,
- D014 (Methoxychlor) = 0.18 mg/kg,
- D015 (Toxaphene) = 1.3 mg/kg,
- D016 (2,4-D) = 10.0 mg/kg,
- D017 (2,4,5-TP (Silvex)) = 7.9 mg/kg
- There are no treatment standards developed for the characteristic organic chemicals from D018 through D043.

Treatability studies have shown that metallic sludges have been effectively sequestered in the glass matrix created by this M-Area Vendor Treatment Process, that leaching has not occurred, and the treatment standards have been met. While it may be necessary to perform treatability studies on soils to verify that they can be successfully treated by this process, indications are that vitrification can meet treatment standards for the waste codes in this waste stream.

Treatment of this waste stream by the M-Area Vendor Treatment Process is not a part of the present contract. If the Vendor is to treat this waste stream arrangements will be needed to adjust the contract. This also will require funding adjustments.

The M-Area Vendor Treatment Process will be designed to treat waste at a rate of 5,000 kg/day of glass.

3.1L.1.3 TREATMENT OPTION INFORMATION

Option Support Justification – IDOA Performed

- The preferred option represents known, demonstrated technology capable of treating waste to comply with LDR requirements.
- Treated waste results in a highly stable waste form suitable for disposal.
- The treatment option produces a significantly volume reduced waste form with a volume reduction of between 5:1 and 1:1.
- The treatment option is an existing, onsite facility. Treatment of this waste stream will not require additional equipment or operating personnel.
- The treatment represents a cost effective option.

Facility Status

The M-Area Vendor Treatment Process is completely designed, with a contract awarded to the vendor for treating M-Area plating sludges and solutions. This additional stream has been given a preliminary analysis by the M-Area project team and identified as being able to feed into the vitrification melter without modification to the melter's construction or configuration. However, the Vendor contract would need to be modified to include this as well as the other additional wastes in the cost, storage, and other pertinent areas affected by the increase of waste volume.

Technology

Treatability demonstrations on the original M-Area wastes have proven the technology to be reliable and able to facilitate the physical waste matrix types identified. Treatability demonstrations for this waste stream may or may not have to be conducted, depending on its similarity to the M-Area plating sludges and solutions.

Regulatory Status

SRS intends to permit the treatment of waste in the M-Area Vendor Treatment Process by an industrial wastewater permit. The vitrification facility is an extension of the M-Area Liquid Effluent Treatment Facility and a part of that treatment train is permitted as an industrial wastewater facility. Preliminary response from SCDHEC has indicated agreement that permitting the vendor treatment facility under a wastewater permit is possible and acceptable. Under the requirements of the Land Disposal Restriction Federal Facility Compliance Agreement, SRS submitted permit applications to SCDHEC for the M-Area Vendor Treatment Process facility on June 24, 1994.

Major permits required are:

- a. Modification to the M-Area Industrial Wastewater Treatment Permit
- b. Interim Status Closure of the M-Area PWIT/SF
- c. Container Storage Permit (either expansion under SRS RCRA Part A Interim Status, or a Part B Permit)
- d. SCDHEC Air Quality Permit for process emissions

The NEPA documentation has been prepared and an EA conducted. A FONSI was issued on August 1, 1994.

Since this waste stream was not identified in the original industrial wastewater permit application made for the M-Area Vendor Treatment Process, it will be necessary to request a permit modification in order to treat this waste stream in the M-Area Vendor Treatment Process. As a part of the permit application, or in place of a formal permit modification, it may be requested that SRS perform a treatability study on the waste stream as evidence of the acceptability of treatment in the vitrification process.

Preparation for Operation

All required permit applications for treating the M-Area plating sludges and solutions were submitted on June 24, 1994 for the original scope (six streams). Since the major permit is a modification to the existing wastewater treatment permit, approval is anticipated within 6 months (12/94). Treatment of the M-Area LDR wastes (i.e., preparation of the initial homogeneous feed batch for the stabilization unit) is targeted to begin with 225 days of permit approvals. Delay in approval of any of the required permits could delay the startup of the treatment process. An additional permit modification to increase the capacity and name the other waste streams will need to be done as soon as possible in order not to impact the M-Area schedule for the plating sludges and solutions.

3.1L.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Negotiations will need to be opened with the Vendor to address the additional waste streams. Funding for treating the M-Area wastes via vitrification has already been budgeted. This stream, in addition to others identified in the DSTP, is not anticipated to inflate the cost of the Vendor treatment, due to its low volume in comparison to the M-Area plating sludges and solutions.

The estimated cost to treat this waste stream is between \$2.5 million to \$5.5 million.

Uncertainty Issues

No technical uncertainties were identified for either waste treatment or radiological concerns. SRS is requesting SCDHEC/EPA to approve the permit modification in order to treat this waste. Budget and scheduling uncertainties may arise without regulatory relief. Applicability of additional evaluation under NEPA creates uncertainty related to budget and schedule for this treatment option.

Section 3.2 Waste Streams for Which Treatment Technology Needs Adaptation

Section 3.2A Organic Liquids

3.2A.1 Radioactive Oil

3.2A.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W036

The preferred treatment option has not been determined for the Radioactive Oil. This waste stream has three viable options: 1) undergo technology development to identify an acceptable method; 2) pretreatment by aging, followed by incineration and stabilization; and 3) treatability variance to allow disposal in the HW/MW Disposal Facility as it is currently packaged. Meanwhile, waste will remain in storage, while the tritium continues to decay.

Background Information:

This waste stream consists of used oil from pumps and compressors in the Tritium Facility that are contaminated with tritium and possibly mercury. Reliable characterization is hindered by personnel exposure concerns and by potential scintillation counting interferences caused by the oil. The potential for mercury contamination is known but not quantified.

Volume

- Current volume through 09/30/93 is 17.2 m³.
- Expected 1993-1997 volume will be 1.6 m³.

Waste Stream Composition

- Organic Liquid

Waste Code

- D009E (hydraulic oil contaminated with Hg and radioactive materials)

LDR Treatment Standard

- Specified technology – Incineration of wastes containing organics and mercury

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is low based on the fact that, waste cannot be sampled for mercury level due to ALARA concerns.

Radiological Characterization

- Extent of tritium contamination is variable (background to ~185 Ci/l)
- Waste is contact handled.
- Mixed low-level waste

3.2A.1.2 TECHNOLOGY AND CAPACITY NEEDS

Radionuclide emissions from CIF, such as tritium, are restricted to annual limits established by the CIF operating permit. This waste stream, Radioactive Oil, contains large quantities of tritium. Because of the high levels of tritium, only a small amount could be incinerated each year to ensure compliance with the annual permit limit. Since approximately 60 years would be required to incinerate this waste stream, SRS is still evaluating treatment alternatives.

“High tritium” oils are a problem if incineration of these oils creates large releases of tritium to the atmosphere. Even with more efficient offgas scrubbers, the atmospheric releases of

tritium may exceed incinerator permit limits. Alternative methods need to be addressed for treating high tritium oils.

Before treatment technologies for the oils can be addressed, analytical characterization of the oils need to be determined. High tritium oils could not be characterized at SRTC due to tritium activities being higher than allowed for the SRTC labs. Reliable tritium assays for the oils are needed to ensure the waste oil does not exceed the design specification of the treatment or disposal facility. An analytical technique needs to be developed which will give reliable mercury concentration assays for high tritium oils. The technique needs to measure mercury in the elemental, ionic, and possibly organo-metallic form, and must be done in a manner which protects the technician from tritium assimilation.

Technologies to explore concerning mercury removal are:

- 1) Impregnated activated carbon – a commercial product with a KI impregnate and sold as a commercial application to remove elemental mercury, organo-mercury and ionic mercury compounds from liquid hydrocarbons.
- 2) Zinc powder/filtration – at Pantex, development work showed mercury was successfully removed from a recycled pump oil using zinc powder followed by filtration. Mercury reduction from 500 ppm to below 0.2 ppm was reported. Development work was not continued past bench scale experiments so scale up and design of a flow column with batch flow parameters would need to be developed.
- 3) Ceramic supported materials – in patents developed by Mobil Oil and others, supported coated materials on alumina used for amalgamation of the mercury (gold, silver/gold mixtures, copper, tin, zinc, zinc in oxide or sulfide forms, sulfur, copper sulfide, and nickel). Current work applied to hydrocarbon condensates so application to oils will need to be explored.

Tritium treatment technologies for high tritium oils include:

- 1) Supercritical oxidation – An alternative to the traditional incineration/combustion process, supercritical oxidation occurs at low temperatures (375 - 525°C), and high pressures (about 3200 psig). This is an emerging technology so data still is being developed. However, this closed system has the advantage of keeping tritium contained.
- 2) Acid catalyzed oxidation – A process being developed at SRTC to completely oxidize organic materials at moderate temperatures and pressures (130° to 200°C and atmospheric to 45 psig).
- 3) Microbial oxidation – Use of microorganisms to degrade hydrocarbons may be studied. The use of microorganisms to degrade tritiated oil samples in an environment designed to contain tritium may be complex and undesirable due to the number of materials added to the oil to degrade the oils and the desire to have nearly 100% conversion of the oils to carbon dioxide and water.
- 4) Plasma Technology – The plasma process has the advantage over incineration and other thermal destruction processes in that it can be carried out in a reducing atmosphere and thus not produce tritiated water. The process converts the oil to carbon coke and soot, and elemental hydrogen. The benefits include reduced personnel hazards since tritiated water is not formed, a reduced waste volume (oil converted to carbon), and the potential to recover tritium.

- 5) Detritiation using catalytic exchange – A proposed method that could remove tritium from the oils in a liquid phase catalytic process in which tritium in the oil is exchanged with a gas on a wet-proof catalyst.
- 6) Tritium recovery using organic decomposition – A coated metal hydride is used to selectively remove hydrogen isotopes from the system and force the equilibrium for the reacting system to further completion. Once tritium is removed, the mercury can be separated from the oil and the oil incinerated; the mercury amalgamated.

3.2A.1.3 TREATMENT OPTION INFORMATION

Three viable options (research and development, pretreatment by aging, and disposal in HW/MW Disposal Facility as is) have been considered.

With the previous information, a proposed technology development path forward, in order of priority is:

- a. Mercury analysis of high tritium oils
- b. Mercury removal techniques
- c. TCLP testing of solidification materials (amalgams, etc.)
- d. Plasma destruction of oil for tritium recovery
- e. Acid catalyzed oxidation of oils
- f. Tritium recovery using organic decomposition
- g. Tritium analysis

SRS has been the only DOE facility involved in tritium production for some time. It is unknown but unlikely that substantial volumes of highly tritiated radioactive oil exist elsewhere within the DOE complex. SRS has received no requests from other sites concerning treatment capacity for high tritium radioactive oil.

The Savannah River Technology Center will be responsible for the research and development of treatment technology for this waste stream. No determination has been made at present concerning the development of a schedule to begin to investigate technology adaptation for this waste stream.

3.2A.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Development of analytical techniques and a treatment technology would require DOE approval and funding. In the meantime, continued safe storage of the radioactive oil will be needed.

This waste will incur storage costs only until pretreatment is complete.

Uncertainty Issues

This waste does not have a straightforward technology for treatment due to the waste's level of tritium and its possible release when a treatment is applied. SRS is requesting SCDHEC/EPA to approve the proposed regulatory discretion continue storage of the waste while a decision is made to: 1) develop a technology through research and analysis; 2) pretreat by aging, followed by incineration and stabilization; and 3) obtain a treatability variance to allow disposal in the HW/MW Disposal Facility as it is currently packaged. To date, no offsite facility has been identified to treat this waste. Safety is a key concern in transporting this tritiated waste.

Section 3.2B Uncategorized Inorganic Particulates

3.2B.1 Silver Coated Packing Material

3.2B.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W009

The preferred treatment option for Silver Coated Packing Material is Macroencapsulation in a stainless steel box in one of the existing canyon facilities by means of a treatability variance.

Background Information:

Referred to as silver saddles, this material is ceramic packing material coated with silver nitrate (silver coated berl saddles) that was used in the offgas systems in the F- and H-Canyon dissolver operations to bond radioactive Iodine¹²⁹ and Iodine¹³¹ emissions to the saddles as silver iodide. Spent packing material was changed out from the process when pluggage occurred. Material is too small to meet the 60 mm minimum standard for debris.

Volume

- Current volume through 09/30/93 is 10.2 m³.
- Expected 1993-1997 volume will be 3.1 m³.

Waste Stream Composition

- Uncategorized inorganic particulate

Waste Code

- Nonwastewater D011A (TCLP Ag)

LDR Treatment Standard

- Concentration based standard = 5.0 mg/l

Waste Characterization

- No analysis due to ALARA concerns but silver value calculated.

Radiological Characterization

- Beta/gamma emitter
- Volatile Radionuclides Iodine¹²⁹ and Iodine¹³¹ (I¹³¹ is a short lived isotope)
- Typical Rad Levels include
 - I¹²⁹ = 62.2 nCi/g
 - Cs¹³⁷ = 3080 nCi/g
 - U²³⁵, U²³⁶, U²³⁸, Pu²³⁹, Pu²⁴⁰
- Process knowledge used to characterize waste stream.
- Waste is remote handled.
- Mixed low-level waste

3.2B.1.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. LDR regulations require that treatment for this waste code meet a concentration based standard of 5.0 mg/l by TCLP test method. To qualify as a debris, the material must be in excess of 60 mm in size. Silver saddles do not meet the size criteria although they meet other requirements to be considered as debris (i.e., manufactured product). The preferred option selection includes the need for a treatability variance. Other preferred options were not relying on a treatability variance since one of the DSTP assumptions is that the treatment will meet the LDR standards. However, in this instance, preparation of a variance had already been initiated to allow for macroencapsulation. Because of the high-level of radioactive contamination, it is not practical to handle this waste stream directly. Approval of a treatability variance to manage this waste stream would allow immobilization of a highly radioactive waste to be recognized as meeting a RCRA LDR treatment. The presence of other waste streams within the DOE complex similar to Silver Coated Packing Material is unknown but considered unlikely.

3.2B.1.3 TREATMENT OPTION INFORMATION

The treatability variance request will ask for approval to treat the Silver Coated Packing Material as "debris like" and to apply the alternate debris technology of macroencapsulation.

With approval of a treatability variance, treatment could be performed in a containment building at SRS where appropriate equipment is available to perform macroencapsulation in a stainless steel container by remote handling under conditions for maximum worker safety.

Treatment in a containment building will require compliance with Subpart DD of Part 264 or 265 of the RCRA regulations. SRS intends to request a modification of its RCRA Part A Permit application in order to immobilize this waste stream.

This treatment option was selected as the preferred option even though it did not have the highest score from the IDOA. The SRS technical analysis team determined through engineering assessment that the identified preferred treatment option represented the most feasible treatment alternative for the waste stream at this time.

Option Support Justification – IDOA Performed

- The preferred option represents simple, effective treatment technology that creates no secondary waste, no emissions, requires little equipment and is simple to permit.
- The final waste form is suitable for transport and disposal without additional treatment. Waste is highly radioactive and requires remote handling. Utilization of canyon facilities as a containment building increases safety through reduced exposure and management of the waste by experienced personnel.

Facility Status

A containment building uses a facility or part of a building which meets the design parameters set forth in 40 CFR Part 264 or Part 265, Subpart DD; to treat or store hazardous waste. This facility would have to be granted Interim Status and have the appropriate equipment installed. The 221-F and 221-H Canyon Buildings are candidate facilities for this treatment since both facilities have ventilation and remote handling capability to perform the macroencapsulation.

Technology

Welding in a stainless steel container is a simple function the Separations facilities can do remotely.

Regulatory Status

A treatability variance is being prepared to petition EPA that Silver Coated Packing Material is "debris-like;" although it doesn't meet the size criteria, its radiological characterization requires it to be immobilized and disposed of in a long-live isotope facility. Since the waste stream already requires immobilization, it is neither cost nor safety effective to perform an LDR treatment to render the waste RCRA non-hazardous when encapsulation will meet the Atomic Energy Act (AEA) requirements for the radioactive iodine and cesium. A solution is to declare the waste stream "debris-like" so the debris technology of macroencapsulation may be applied, thus meeting both RCRA and AEA treatment requirements.

Preparation for Operation

Besides the conditions listed under Facility Status and meeting the design parameters set forth in 40 CFR Part 264 or Part 265, Subpart DD; a Waste Analysis Plan, operational procedures, a log book including compliance and inspection plans, and appropriate training would have to be completed.

3.2B.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Presently there is no funding allocation for the treatment of this waste stream. Development of line item funding will be required before waste treatment can be performed.

The estimated cost to treat this waste stream is between \$3 million and \$7 million.

Uncertainty Issues

This waste does not have a straightforward technology for treatment due to the waste's level of radioactivity and its requirement to be remote-handled. SRS is requesting SCDHEC/EPA to approve the proposed regulatory discretion when it submits a treatability variance for the waste being "debris-like" and the request to treat this waste with the debris technology of macroencapsulation. Concurrently, exemptions to DOE Orders 6430.1A and 4700 on a case-by-case basis would significantly decrease the cost to treat this waste in an existing building under the Containment Building option.

Section 3.3 Waste Streams in Need of Further Characterization

Section 3.3A Organic Debris

3.3A.1 Solvent Waste <100 nCi/g TRU

3.3A.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W025

The preferred option for Solvent Waste with Less Than 100 nCi/g Transuranic Radionuclides (TRU) is to develop a plan to further characterize this waste stream to determine what components are suitable for shipment to the Waste Isolation Pilot Plant (WIPP) as TRU waste and what portion can undergo further option analysis for treatment as mixed low-level waste.

Background Information:

The waste stream is composed primarily of solids such as booties, lab coats, floor sweepings, rags, labware, and other job control waste generated through separation activities for plutonium production. The waste stream includes small amounts of transuranic waste from onsite laboratories. Waste is declared mixed because solvent rags are suspected of being in the waste. A conservative reading of the mixture rule causes all contents in a container to be characterized as listed waste due to the presence of solvent rags.

Volume

- Current volume through 09/30/93 is 2791.2 m³.
- No future waste generation expected because of a program implemented to segregate F-listed solvent rags from other job control waste. This waste stream ceased to be generated when the program began. (Thirds TRU <100 nCi/g is the current waste stream which evolved from SR-W025 under current F-listed solvent waste segregation.)

Waste Stream Composition

- Organic Debris

Waste Code

- D001C (Ignitable), D003D, D004A, D006A, D007A-9A, D011A (TCLP metals), D018-D019, D022-D026 (characteristic organics), F001-3, F005A, (halogenated and nonhalogenated spent solvents), P012, P015, P048, P113, P120 (acutely toxic commercial chemical wastes), U002, U032, U052, U080, U133, U134, U144, U151, U154, U161, U209, U211, U220, U226, U239 (commercial chemical wastes)

LDR Treatment Standard

- D001C, D003D specified technology – DEACT and meet F039 standards
- D004, D006-D009, D011; F001-F003, F005, P012, P048, U002, U032, U052, U080, U144, U151, U161, U209, U211, U220, U226, U239 concentration based standards = 0.025-170 mg/kg except 2-Ethoxyethanol, 2-Nitropropane-incineration
- D018-D019, D022-D026 no treatment standards yet developed by EPA
- P015 specified technology = RMETL or RTHRM
- P113 specified technology = RTHRM or STABL
- P120 specified technology = STABL
- U133 specified technology = FSUBS, CHOXD, CHRED or INCIN
- U134 specified technology = ADGAS fb NEUTR or NEUTR
- U154 specified technology = FSUBS or INCIN
- Alternate debris technology can be applied.

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is medium based on the varying composition of the job waste and the exact contents of specific waste containers.

Radiological Characterization

- Total activity is 10-100 nCi/g
- Contains Pu²³⁸, Pu²³⁹, Pu²⁴⁰, Pu²⁴¹, Pu²⁴², Am²⁴¹, U²³³, H³, Co⁶⁰, Cs¹³⁷, and other isotopes. Waste stream contains transuranics and alpha emitters.
- Waste is contact handled.
- Mixed low-level waste

3.3A.1.2 CHARACTERIZATION PLAN

This waste stream does not meet the DOE definition of transuranic waste (TRU). However, the heterogeneous items that make up this waste stream and the location where the waste was generated could result in transuranic contamination of the waste. The conservative approach would be to manage this waste in the same manner as transuranic waste. In handling this alpha waste, personnel safety and exposure concerns, to protect from alpha contamination, are similar for both TRU waste and the 10-100 nCi/g waste streams.

This waste stream needs further characterization. Once characterization is performed, a determination can be made as to which portion should be managed as TRU waste and which should be managed as low-level waste. SRS has developed a management plan proposing strategies for the management of TRU waste until WIPP is ready to accept waste. The SRS Transuranic Waste Management Plan is in Chapter 4. In addition, the Waste Management Environmental Impact Statement will investigate alternatives for the interim management of TRU waste destined for WIPP as well as TRU waste which cannot meet the WIPP waste acceptance criteria and must be handled through alternate management methods.

Once a plan has been developed and initiated for identifying and isolating the TRU waste components within the waste stream, technical option analysis can proceed for development of a treatment option for that portion of the waste stream identified as mixed low-level waste. Apart from the TRU waste component, this waste stream is similar to waste stream SR-W055 and SR-W056. For this waste matrix incineration is an appropriate technology; however, the possibility of creating TRU waste when incinerating mixed low-level waste with high-levels of TRU radionuclides, causes a dilemma. As a result, the conservative approach taken is to manage this waste in the same manner as a transuranic waste.

3.3A.1.3 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

No cost estimate can be developed for the waste stream until a preferred option is determined. See the TRU Waste Management Plan, Chapter 4.

Uncertainty Issues

This waste does not have a preferred technology for treatment due to the need for further waste characterization, and treatability studies. SRS is requesting SCDHEC/EPA to approve the proposed regulatory discretion when it submits a request to continue storage until Transuranic Waste Facility (TWF) is completed and assaying can be done. Budget and schedule uncertainties exist regarding the treatment of this waste stream and the processing so that waste residues are considered TRU waste and sent to WIPP.

3.3A.2 Thirds Waste <100 nCi/g TRU Rad

3.3A.2.1 GENERAL INFORMATION

Waste Stream Number: SR-W033

The preferred option for Thirds Waste with Less Than 100 nCi/g Transuranic Radionuclides (TRU) is to develop a plan to further characterize this waste stream to determine what components are suitable for shipment to the Waste Isolation Pilot Plant (WIPP) as TRU waste and what portion can undergo option analysis for treatment as mixed low-level waste.

Background Information:

The waste stream is composed primarily of solids such as booties, lab coats, floor sweepings, rags, labware, and other job control waste generated primarily through separation activities for plutonium production. The waste stream includes small amounts of transuranic waste from onsite laboratories.

Volume

- Current volume through 09/30/93 is 8.0 m³.
- Expected 1993-1997 volume will be 25 m³.

Waste Stream Composition

- Organic Debris

Waste Code

- D001C (Ignitable), D003D, D004A, D006A, D007A-D009A, D011A (TCLP metals), D018-19, D022-26 (characteristic organics), P012, P015, P048, P113, P120 (acutely toxic commercial chemical wastes), U002, U032, U052, U080, U133, U134, U144, U151, U154, U161, U209, U211, U220, U226, U239 (commercial chemical wastes)

LDR Treatment Standard

- D001C, D003D specified technology – DEACT and meet F039 standards
- D004, D006-D009, D011, P012, P048, U002, U032, U052, U080, U144, U151, U161, U209, U211, U220, U226, U239 concentration based standards = 0.025-160 mg/kg
- D018-D019, D022-D026 no treatment standards yet developed by EPA
- P015 specified technology = RMETL or RTHRM
- P113 specified technology = RTHRM or STABL
- P120 specified technology = STABL
- U133 specified technology = FSUBS, CHOXD, CHRED or INCIN
- U134 specified technology = ADGAS fb NEUTR or NEUTR
- U154 specified technology = FSUBS or INCIN
- Alternate debris technology can be applied.

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium based on the varying composition of the job waste as it is generated.

Radiological Characterization

- Total activity is 10-100 nCi/g
- Contains Pu²³⁸, Pu²³⁹, Pu²⁴⁰, Pu²⁴¹, Pu²⁴², Am²⁴¹, U²³³, H³, Co⁶⁰, Cs¹³⁷, and other isotopes (transuranics and alpha emitters)
- Waste is contact handled.
- Mixed low-level waste

3.3A.2.2 CHARACTERIZATION PLAN

This waste stream does not meet the DOE definition of transuranic waste (TRU). However, the heterogeneous items that make up this waste stream and the location where the waste was generated could result in transuranic contamination of the waste. The conservative approach would be to manage this waste in the same manner as transuranic waste. In handling this alpha waste, personnel safety and exposure concerns, to protect from alpha contamination, are similar for both TRU waste and the 10-100 nCi/g waste streams.

This waste stream needs further characterization. Once characterization is performed, a determination can be made as to which portion should be managed as TRU waste and which should be managed as low-level waste. SRS has developed a management plan proposing strategies for the management of TRU waste until WIPP is ready to accept waste. The SRS Transuranic Waste Management Plan is in Chapter 4. In addition, the Waste Management Environmental Impact Statement will investigate alternatives for the interim management of TRU waste destined for WIPP as well as TRU waste which cannot meet the WIPP waste acceptance criteria and must be handled through alternate management methods.

Once a plan has been developed and initiated for identifying and isolating the TRU waste components within the waste stream, technical option analysis can proceed for development of a treatment option for that portion of the waste stream identified as mixed low-level waste. Apart from the TRU waste component, this waste stream is similar to waste stream SR-W055 and SR-W056. For this waste matrix incineration is an appropriate technology; however, the possibility of creating TRU waste when incinerating mixed low-level waste with high-levels of TRU radionuclides, causes a dilemma. As a result, the conservative approach taken is to manage this waste in the same manner as a transuranic waste.

3.3A.2.3 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

No cost estimate can be developed for this waste stream until a preferred option is determined. See the TRU Waste Management Plan.

Uncertainty Issues

This waste does not have a preferred technology for treatment due to the need for further waste characterization and treatability studies. SRS is requesting SCDHEC/EPA to approve the proposed regulatory discretion when it submits a request to continue storage until Transuranic Waste Facility (TWF) is complete and assaying can be done. Budget and schedule uncertainties exist regarding the treatment of this waste stream and the processing so that waste residues are considered TRU waste and sent to WIPP.

CHAPTER 4 MIXED TRANSURANIC (MTRU) WASTE STREAMS

Section 4.1 Mixed Transuranic Waste Streams Destined for the Waste Isolation Pilot Plant

4.1.1 The National Program

The TRU National Program Plan is committed to emplacing all DOE defense related TRU type wastes (including mixed TRU wastes) into a National Repository currently identified as the Waste Isolation Pilot Plant (WIPP) located in Carlsbad, New Mexico. The current TRU waste treatment policy consists of minimal treatment of TRU waste so that it conforms to the WIPP disposal waste acceptance criteria (WAC). This position utilizes the RCRA No Migration Petition approach provided in 40 CFR 268.6.

The Hazardous and Solid Waste Amendments (HSWA) of 1984, which amend the Resource Conservation and Recovery Act (RCRA), imposed substantial new requirements on the land disposal of hazardous waste. In particular, the amendments prohibit the continued land disposal of hazardous waste, unless either 1) the wastes meet treatment standards specified by the Environmental Protection Agency (EPA), or 2) the administrator determines that the prohibition is not required in order to protect human health and the environment. The latter determination must be based on a demonstration by the owner/operator of the facility receiving the waste "that there will be no migration of hazardous constituents from the disposal unit or injection zone as long as the waste remains hazardous" (RCRA sections 3004(d)(1), (e)(1), and (g)(5)).

The DOE is undertaking a comprehensive systems prioritization analysis (which analyzes all variables – waste profiles, repository design, treatment options, etc.) of the disposal site to determine if migration of hazardous constituents from the disposal unit will occur as long as the waste remains hazardous and to determine that all applicable regulatory requirements can be satisfied. The systems prioritization analyses will ascertain what treatment needs, if any, will be required to ensure disposal compliance.

The WIPP/WAC will define the criteria and requirements to regulate and ensure the safe handling and preparation of TRU waste packages for transportation and emplacement at WIPP. The WIPP/WAC will include the TRU waste characteristics for disposal at WIPP and will be based upon the results of the systems prioritization analysis and performance assessment (considers 10,000 year containment period), condition of the final RCRA Part B Permit, conditions of the No-Migration Determination, transportation criteria, and facility operational safety requirements. Generators and storage sites cannot ship waste to WIPP for disposal until the waste is processed, treated, (if required) packaged, and certified to the WIPP/WAC.

The DOE is actively gathering inventory and characterization data for input into the performance assessment and preparing several regulatory submittals to EPA to demonstrate compliance. The current plan is to submit a Draft Compliance Certification Package to EPA in March 1995, submit a No-Migration Petition to EPA by May 1995, a revised RCRA Part B permit to the New Mexico Environment Department by June of 1995, a Final Compliance Certification Package (including final performance assessment results) to EPA by December 1996, and the Final WIPP/WAC by June 1997. DOE plans to declare operational readiness for WIPP by December 1997. Disposal of contact handled (CH) TRU waste will begin in June 1998 followed by remote handled (RH) TRU waste in June of 1999.

An integral part of this analysis will be discussions with the states and other stakeholders as well as their involvement in DOE's decision making process. The stakeholders will have major opportunities to provide their assessments of the scientific analyses and the proposed WIPP/WAC, and their comments will be considered in the DOE decision making process. Based on discussions with EPA, if it appears by December 1996 (the date of the submittal of the compliance package for the WIPP) that there will be significant delays in the opening of

WIPP, discussions will take place with the States regarding alternative treatments. DOE will continue to evaluate alternative treatment options and associated system impacts through the PEIS process and additional studies. The additional studies will consist of conceptual analyses of potential treatment options and treatment studies that may be required from the systems analysis and the performance assessment activities. Results of these studies will be shared with the States through Stakeholder meetings.

4.1.2 TRU Waste at the SRS

Transuranic waste can be defined as waste contaminated with alpha-emitting transuranic radionuclides having half-lives greater than 20 years and concentrations greater than 100 nanocuries per gram (nCi/g). Transuranic nuclides also have atomic numbers greater than 92 on the atomic chart. All SRS TRU waste is DOE defense related TRU type waste.

In 1970, The Atomic Energy Commission (AEC) issued an Immediate Action Mandate IAD-0511-21 which required that solid wastes containing transuranic elements be segregated in containers which could be retrieved for permanent storage, contamination free, within 20 years.

In 1974, procedures were modified to reflect the AEC criteria. Polyethylene-lined galvanized 55 gallon drums were used as the primary container for <0.5 Ci/package. Fifty-five gallon drums containing >0.5 Ci/package were additionally protected by enclosure in a concrete culvert, 14 drums being placed in each culvert. These containers, along with large carbon steel boxes containing bulk equipment and concrete casks, were placed on above ground pads and covered with a 4 foot soil overburden. The soil provided additional shielding and weather protection. There are a total of five waste pads which are filled and covered with soil. A sixth pad was filled with waste and was in the early stages of coverage with dirt when a decision was made to discontinue this type of storage. This pad is open on the top with dirt pushed up along the pad edges.

In 1986, in anticipation of a WIPP facility opening, TRU waste containers were stored on concrete pads without being covered with soil. Concrete culverts containing fourteen 55 gallon drums each, single 55 and 83 gallon drums, and carbon steel boxes are stored on these pads. There are nine open air pads and four pads with sprung roof structures. In recent years, some of the single drums on the open air pads have been found to have rainwater intrusion and efforts are underway to dewater and store these containers on pads with sprung roof structures. Seventeen of the TRU pads at SRS are currently under RCRA interim status.

Numerous project activities have been conducted at the SRS in recent years in an attempt to align waste preparation with a developing WIPP WAC. Continued delays in the start date of the WIPP facility and changes in the WIPP/WAC have resulted in the need to re-evaluate the site's plans for handling, storage and preparation of these waste streams. Recognizing the uncertainty in the current WIPP program, the Transuranic Waste Management Plan provides for an integrated approach to continued safe interim storage, retrieval of some TRU containers reaching their design life, identification of potential treatment options for mitigation of transportation and storage concerns and resolution of TRU "orphan waste" issues.

Even though TRU waste is defined as waste contaminated to greater than 100 nCi per gram of waste (100 nCi/g), SRS continues to manage transuranic wastes suspected of containing 10 nCi/g or higher as TRU waste. This is based on assay analysis technology being limited in its ability to accurately analyze down to the 100 nCi level. Any waste suspect to contain transuranics is defined as TRU and managed as such.

There are three MTRU waste streams and two mixed low-level waste (MLLW) streams that are managed as TRU waste. Some of these wastes may not go to WIPP depending on final WIPP-WAC requirements and final treatment processes.

The waste streams identified in the MWIR are:

Waste Stream No.	Description	Volume Cubic Meters
SR W006	Mixed TTA/Xylene	0.1
SR W025	Solvent Waste <100 nCi/g TRU (MLLW managed as TRU)	2791.2
SR W026	Thirds TRU Waste	67.0
SR W027	Solvents TRU Waste	4955.6
SR W033	Thirds Waste <100 nCi/g TRU (MLLW managed as TRU)	8.0

Two of these waste streams (SR-W025, SR-W033) fall into the category of <100 nCi/g and as indicated above, are currently managed as TRU waste. They are referred to as "orphan wastes," because they potentially fit into one or more waste classifications. When an appropriate facility is constructed, these two waste streams will be further characterized and portions that are TRU waste being sent to WIPP. The remaining mixed low-level component will undergo options analysis to identify an appropriate treatment option. The largest fraction of these two waste streams will fall into this latter category.

Options Analysis

Options analysis and selection of preferred options for TRU waste treatment are not addressed in this document. SRS has developed a strategy in regard to characterization, preparation to meet the WIPP-WAC, and interim storage of transuranic waste prior to shipment to the WIPP. This strategy is developed in the SRS Transuranic Waste Management Plan that follows.

SRS Transuranic Waste Management Plan

The SRS Transuranic Waste Management Plan supports and is in alignment with the National Program initiatives. The SRS Transuranic Waste Management Plan identifies the specific activities necessary to safely store and manage this waste as well as the developmental steps toward potential treatment options. Execution of this plan will position SRS as best as possible to ship waste to the WIPP at the appropriate time.

Plan Assumptions

The plan is based upon these key assumptions :

- All SRS TRU waste (>100 nCi/g) will be sent to the WIPP for disposal.
- WIPP will receive a No-Migration Determination from RCRA-LDR.
- All TRU waste will be shipped (offsite) using the TRUPACT-II (assumes TRUPACT-II SARP modification for higher activity fraction).

Plan Issues

The plan is developed to address these key issues:

- SRS TRU Waste Management efforts will be limited pending a final WIPP-WAC.
- Drums placed in direct contact with the overburden soil under the earthen mounds have begun to reach their 20 year design life.

- Waste package records of stored waste are primarily in a computer database called Computerized Radioactive Waste Burial Record Analysis system (COBRA). The data retained is general in nature and limited to generating facility, dates, volumes, radionuclide content and general storage location. Other information is retained on paper records only.
- High activity TRU waste may require treatment to meet transportation requirements for shipment to the WIPP. This treatment may be needed for the destruction of organic materials to eliminate gas generation as a result of radiolysis. Decisions on pretreatment options will be deferred until more information is available on the WIPP-WAC.
- Performance based waste acceptance criteria is under development by WIPP and an initial draft is expected in September 1994. Final criteria defining characterization and waste certification requirements are not expected until 1996.
- The unavailability of adequate assay technology to accurately analyze down to the 100 nCi/g level has resulted in SRS being unable to reclassify some wastes as low-level waste (LLW) or MLLW.

Plan Activities

The TRU Waste Management Plan addresses the following activities and provides a path forward for resolution:

- Interim Storage
- TRU Waste Retrieval
- Treatment Studies
- Data Collection
- Orphan Waste

Interim Storage

Based on information provided by the National TRU Program Office concerning WIPP startup, it is necessary to provide interim storage capability to continue safe monitoring of TRU storage. In support of this requirement, a mixed waste storage strategy is under development at the SRS which will provide SRS adequate storage for existing and newly generated TRU wastes through the year 2000. As part of the strategy, a container management plan is being developed to reorganize existing storage containers and maximize the efficient use of TRU storage space. The plan will achieve optimum utilization of available space considering various constraints such as criticality control, weather protection, RCRA permitting, segregation by waste type, container type, generator etc. Additional storage areas have been identified, permitted capacity allocations applied to these areas and a reapportionment of unusable interim status capacity requested from SCDHEC. This Interim Strategy, which is still under development, is expected to be approved by DOE and implemented beginning in FY95. In addition, excessed facilities such as Reactor buildings at SRS, are being considered for storage of TRU and MTRU wastes in an attempt to assure a longer term safety envelope.

TRU Retrieval

Drums placed in direct contact (<0.5 Ci/drum) with overburden soil under the earthen mounds have begun to reach their original 20 year retrievable life. A retrieval project has been initiated to provide the equipment and technology to safely recover these drums from the mounds, overpack them and re-store them in a safe configuration. In addition, these drums will have an activated carbon filter inserted to prevent gas accumulation, and a headspace sample taken for VOCs as part of a baseline characterization process. This program

is funded under Line Item 90-D-176. It has high priority and is scheduled for startup in late FY97 or early FY98.

Treatment Studies

The baseline assumption is that all TRU waste currently being generated and in storage at SRS will eventually be shipped to WIPP under the No-Migration Petition. The possibility exists that treatment may be required for a portion or all of the TRU waste which will eventually be prepared for shipment. This treatment may be required to meet LDR standards or it may be required in order to ship the higher activity fraction (Pu^{238}) to WIPP. This waste is 280 times more active than Pu^{239} and currently can not be shipped in the TRUPACT-II (the vehicle designed to transport TRU waste). TRUPACT-II is limited to 20 curies based on heat load and gas generation as a result of radiolysis. This would mean shipping approximately 1 gram of Pu^{238} in each TRUPACT-II shipment to WIPP. SRS is unique in this aspect since most of the Pu^{238} in the DOE complex is located at SRS. Pu^{238} represents 36% of the TRU waste volume at SRS, but 68% of the total curies.

Treatment studies will be conducted to evaluate potential technologies which would treat TRU waste to meet LDR and to eliminate gas generation by destroying organics thus preventing radiolysis from occurring. The Office of Technology Development (OTD) has funded several activities at SRS including vitrification and plasma hearth demonstrations. Both of these technologies provide stable waste forms and destroy organics and hazardous constituents to meet LDR requirements. Work will proceed in FY95 to develop a plasma hearth demonstration using simulated TRU waste. Vitrification activities are underway currently and will continue in FY95 to demonstrate that this technology will work with these waste streams. In addition, development of acid digestion technologies for organics is planned in FY96 provided funding is available.

As more information becomes available from the systems analysis work currently in progress at WIPP, and WIPP/WAC requirements become final, SRS facility requirements necessary to characterize and certify wastes can be developed. Previous attempts to predict the outcome of the WIPP studies and proposed WAC requirements resulted in recommendations to develop characterization facilities such as the Low Activity TRU Facility (LATF), which was conceptually developed around WIPP/WAC Revision 4, providing characterization, repackaging and certification for low activity TRU waste. This facility was put on hold in FY93 based on continuing uncertainties in the WIPP program and the inception of the Site Treatment Plan development. This facility and a High Activity TRU Facility (HATF) which would actually perform final treatment will be re-evaluated at the appropriate time. SRS is also investigating the potential shipment of TRU waste to other DOE sites which would certify this waste for eventual shipment to WIPP.

Data Recovery and Transcription

All paper and electronic records including the COBRA records of TRU wastes will be transferred into the Waste Information Tracking System (WITS) database to allow easy data manipulation. Verification that this system has considered the potential applications to future processing, characterization, certification and transportation requirements will be conducted. This program will be aligned with the Container Management Plan defined in Chapter 7. The upgrade of this data management system, including both hardware and software will begin in FY95.

Assay Technology and Orphan Waste

Per DOE Headquarters guidance, SRS has certain wastes which are classified as non TRU since they fall below the 100 nCi/g level and would normally be identified as MLLW. This has resulted in delaying decisions as to the final classification of these wastes. Based on this delay, these wastes will continue to be managed as TRU and will be considered for shipment to

WIPP without LDR treatment. When improved assay capability is available, it is anticipated that most of these wastes will be reclassified as non-TRU mixed wastes. They present a rather unique problem, however, since acceptable treatment options for these wastes (if they were managed as non TRU mixed wastes and LDR treatment would be required) could end up concentrating the TRU fraction, thus potentially increasing this fraction above 100 nCi/g level. Because of this, there is uncertainty as to how to deal with this waste. For the present, these streams will continue to be managed as TRU waste until enhanced assay capability is available and treatment requirements are established.

TRU Plan Flow Chart

A flow chart has been developed which outlines the activities identified in the TRU Management Plan.

- TRU waste in mounded storage will be retrieved and placed in reconfigured storage.
- TRU waste storage configurations will be entered into the WITS data management system.
- TRU waste packages that meet transportation requirements but require processing to meet WIPP-WAC, may be sent to other non-SRS facilities for processing.
- SRS will construct and operate TRU waste processing facilities to characterize/certify TRU waste, as required for meeting the WIPP-WAC, including transportation requirements.
- Studies will be done to identify treatment options both for the LDR component of the waste and for possibly stabilizing the TRU isotopes which may be required for shipment and disposal.

TRU Waste Process Diagram

Section 4.1A Organic Debris

4.1A.1 Thirds TRU Waste

4.1A.1.1 GENERAL INFORMATION

Waste Stream Number: **SR-W026**

The TRU National Program Plan is committed to placing all DOE defense related TRU type wastes (including TRU mixed wastes) into a National Repository currently identified as the Waste Isolation Pilot Plant (WIPP). Option analysis and selection of preferred option for TRU waste treatment are not addressed in this document. SRS has developed a strategy in regard to characterization, preparation to meet the WIPP-WAC, and interim storage of transuranic waste prior to shipment to the WIPP. This strategy is developed in the SRS Transuranic Waste Management Plan.

Background Information:

This waste stream is a defense-related TRU waste and is composed primarily of solids such as booties, lab coats, floor sweepings, rags, labware, and other job control waste generated primarily through Separation activities for plutonium production.

Volume

- Current volume through 09/30/93 is 67 m³.
- Expected 1993-1997 volume will be 204 m³.

Waste Stream Composition

- Organic Debris

Waste Code

- D001C (Ignitable), D003D, D004A, D006A, D007A-D009A, D011A (TCLP metals), D018-19, D022-26 (characteristic organics), P012, P015, P048, P113, P120 (acutely toxic commercial chemical wastes), U002, U032, U052, U080, U133, U134, U144, U151, U154, U161, U209, U211, U220, U226, U239 (commercial chemical products)

LDR Treatment Standard

- Manage at the Waste Isolation Pilot Plant (WIPP) through a no migration determination.

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is medium based on the varying composition of the job waste as it is generated.

Radiological Characterization

- Total activity is >100 nCi/g
- Contains Pu²³⁸, Pu²³⁹, Pu²⁴⁰, Pu²⁴¹, Pu²⁴², Am²⁴¹, U²³³, H³, Co⁶⁰, Cs¹³⁷, and other isotopes (transuranics and alpha emitters)
- Waste is contact handled.
- Mixed transuranic waste (MTRU)

4.1A.1.2 TECHNOLOGY AND CAPACITY NEEDS

For information on the management of this waste stream, see the SRS TRU Waste Management Plan in Section 4.1.2 of this document.

The total volume of MTRU waste at SRS is substantial. The need for appropriate storage while DOE develops the Waste Acceptance Criteria for the WIPP and awaits approval by EPA of the

No Migration Petition is significant. After the WIPP waste acceptance criteria is approved, the waste will need to be further characterized and prepared to meet the waste acceptance criteria and to be properly packaged for shipment to WIPP.

There are no technology or capacity needs to discuss at this time. Once the WIPP WAC is finalized, project planners will develop cost estimates and schedules to implement the SRS TRU Waste Management Plan.

4.1A.1.3 TREATMENT OPTION INFORMATION

Please see the TRU Waste Management Plan in Section 4.1.2 of this chapter.

4.1A.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

No cost estimate was prepared for this waste stream.

Uncertainty Issues

This MTRU waste is to be prepared to meet the WAC for WIPP, provided WIPP is granted a no-migration determination from EPA. Budget and schedule uncertainties exist regarding the handling of this waste stream. Transportation of this waste stream to WIPP raises issue to be addressed by affected state agencies (e.g., receiving state and corridor states) and their stakeholders.

4.1A.2 Solvent TRU Waste

4.1A.2.1 GENERAL INFORMATION

Waste Stream Number: SR-W027

The TRU National Program Plan is committed to placing all DOE defense related TRU type wastes (including TRU mixed wastes) into a National Repository currently identified as the Waste Isolation Pilot Plant (WIPP). Option analysis and selection of preferred option for TRU waste treatment are not addressed in this document. SRS has developed a strategy in regard to characterization, preparation to meet the WIPP-WAC, and interim storage of transuranic prior to shipment to the WIPP. This strategy is developed in the SRS Transuranic Waste Management Plan.

Background Information:

This waste stream is a defense-related TRU waste and is composed primarily of solids such as booties, lab coats, floor sweepings, rags, labware, and other job control waste generated primarily through separation activities for plutonium production. Waste was declared mixed because solvent rags are suspected of being in the waste containers. Due to the presence of these listed solvent rags, a conservative application of the mixture rule is appropriate. Therefore, the entire container contents must be treated as listed waste.

Volume

- Current volume through 09/30/93 is 4955.6 m³.
- No future waste generation expected because of the program implemented to segregate F-listed solvent rags from other job control waste. This waste stream ceased to be generated when the program began. (Thirds TRU is the current waste stream which evolved from SR-W027 under current F-listed solvent waste segregation.)

Waste Stream Composition

- Organic Debris

Waste Code

- D001C (Ignitable), D003D, D004A, D006A, D007A-D009A, D011A (TCLP metals), D018-19, D022-26 (characteristic organics), F001-F003, F005A, (halogenated and nonhalogenated spent solvents), P012, P015, P048, P113, P120 (acutely toxic commercial chemical wastes), U002, U032, U052, U080, U133, U134, U144, U151, U154, U161, U209, U211, U220, U226, U239 (commercial chemical wastes)

LDR Treatment Standard

- Manage at the WIPP through a no migration determination.

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is medium based on the varying composition of the job waste and the exact contents of specific waste containers.

Radiological Characterization

- Total activity is >100 nCi/g
- Contains Pu²³⁸, Pu²³⁹, Pu²⁴⁰, Pu²⁴¹, Pu²⁴², Am²⁴¹, U²³³, H³, Co⁶⁰, Cs¹³⁷, and other isotopes.
- Waste is contact handled.
- Mixed transuranic waste (MTRU)

4.1A.2.2 TECHNOLOGY AND CAPACITY NEEDS

For information on the management of this waste stream, see the SRS TRU Waste Management Plan in Section 4.1.2 of this document.

The total volume of MTRU waste at SRS is substantial. The need for appropriate storage while DOE develops the Waste Acceptance Criteria for the WIPP and awaits approval by EPA of the No Migration Petition for WIPP is significant. After the waste acceptance criteria for WIPP is approved, the waste will need to be further characterized and prepared to meet the waste acceptance criteria and to be properly packaged for shipment to WIPP.

There are no technology or capacity needs to discuss at this time. Once the WIPP WAC is finalized, project planners will develop cost and schedules to implement the SRS TRU Waste Management Plan.

4.1A.2.3 TREATMENT OPTION INFORMATION

Please see the TRU Waste Management Plan in Section 4.1.2 of this chapter.

4.1A.2.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

No cost estimate was prepared for this waste stream.

Uncertainty Issues

This MTRU waste is to be prepared to meet the Waste Acceptance Criteria for WIPP, provided WIPP is granted a no-migration determination from EPA. Budget and schedule uncertainties exist regarding the handling of this waste stream. Transportation of this waste stream to WIPP raises issues to be addressed by affected state agencies (e.g., receiving state and corridor states) and their stakeholders.

Section 4.1B Organic Liquids

4.1B.1 Mixed TTA/Xylene

4.1B.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W006

The TRU National Program Plan is committed to placing all DOE defense related TRU type wastes (including TRU mixed wastes) into a National Repository currently identified as the Waste Isolation Pilot Plant (WIPP). Option analysis and selection of preferred option for TRU waste treatment are not addressed in this document. SRS has developed a strategy in regard to characterization, transuranic waste, preparation to meet the WIPP-WAC, and interim storage of transuranic waste waiting characterization, processing, and prior to shipment to the WIPP. This strategy is developed in the SRS Transuranic Waste Management Plan.

Background Information:

This waste stream is defense-related TRU waste consisting of laboratory waste generated from plutonium extraction analytical procedures at SRTC. It consists of a homogeneous xylene based liquid chelating agent. TTA stands for Thenoyl Trifluoroacetone.

Volume

- Current volume through 09/30/93 is 0.1 m³.
- There will be no future waste generation because a substitute nonhazardous organic was identified for the lab procedure.

Waste Stream Composition

- Organic Liquid

Waste Code

- D001A (Ignitable high TOC)

LDR Treatment Standard

- Manage at WIPP through a no migration determination.

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based upon knowledge of the chemicals used in the analytical procedures.

Radiological Characterization

- Total activity is 100 nCi/g.
- Contains for transuranic contaminants of Pu²³⁹, Am²⁴¹.
- Waste is contact handled.
- Mixed transuranic waste (MTRU)

4.1B.1.2 TECHNOLOGY AND CAPACITY NEEDS

This waste stream is very small and is currently stored in accordance with RCRA in a satellite accumulation area at SRTC. After the waste acceptance criteria for WIPP is approved, this waste will have to be further characterized and treated to meet the waste acceptance criteria that requires removing any liquid and properly packaging the waste to ship to WIPP. Another possibility being evaluated is treating the waste as a 90-day generator and removing the TRU portion of the stream to treat the ignitable characteristic.

For information on the management of this waste stream, see the SRS TRU Waste Management Plan in Section 4.1.2 of this document.

4.1B.1.3 TREATMENT OPTION INFORMATION

Please see the TRU Waste Management Plan in Section 4.1.2 of this chapter.

4.1B.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

No cost estimate was prepared for this waste stream.

Uncertainty Issues

This MTRU waste is to be prepared to meet the Waste Acceptance Criteria for WIPP, provided WIPP is granted a no-migration determination from EPA. Because of the small volume of this waste stream, it must be rendered a non-liquid and meet the specification for WIPP storage. Budget and schedule uncertainties exist regarding the handling of this waste stream. Transportation of this waste stream to WIPP for treatment raises issues to be addressed by affected state agencies (e.g., receiving state and corridor states) and their stakeholders.

Section 4.2 Other Transuranic Waste Streams

Section 4.2A Inorganic Sludges and Particulates

4.2A.1 Rocky Flats Incinerator Ash

4.2A.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W053

The preferred treatment option for the Rocky Flats Incinerator Ash waste stream is to return the waste to Rocky Flats for consolidation and treatment with similar wastes and treatment.

Background Information:

This waste consists of a small volume of ash sent from Rocky Flats to SRS for research into plutonium recovery. Colorado courts declared the ash generated by Rocky Flats to be hazardous waste based on F-listed solvent waste processed in the Rocky Flats incinerator. SRS concurred with the declaration and placed the ash in a satellite accumulation area.

Volume

- Current volume through 09/30/93 = 0.1 m³.
- No future waste generation expected because waste originally came as sample material to run plutonium extraction studies. Once the Rocky Flats ash was declared a waste, plutonium studies were canceled.

Waste Stream Matrix

- Inorganic Sludge/Particulate

Waste Code

- D004A (TCLP As), D005A (TCLP Ba), D006A (TCLP Cd), D007A (TCLP Cr), D008A (TCLP Pb), D009A (TCLP Hg), D010A (TCLP Se), D011A (TCLP Ag), F001, F002, F005A (halogenated and nonhalogenated spent solvents)

LDR Treatment Standard

- Eventual management at WIPP through a no migration determination.

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level low. No analytical data, material is from another DOE site.
- It was declared a waste after SRS had the material in a vault and was handling it as Special Nuclear Material (SNM).

Radiological Characterization

- Transuranic – alpha emitters
- Waste is contact handled.
- Mixed transuranic waste (MTRU)

4.2A.1.2 TECHNOLOGY AND CAPACITY NEEDS

Rocky Flats is performing an option analysis. Results of that analysis will identify technology and capacity needs.

4.2A.1.3 TREATMENT OPTION INFORMATION

It is much more cost effective for SRS to return this small volume of waste to Rocky Flats than to characterize, develop treatment methods for, and treat the waste while Rocky Flats

takes action for their large volume of identical waste. Rocky Flats is performing an option analysis to determine the preferred treatment for their inventory of incinerator ash.

4.2A.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

The estimated cost to treat this waste stream is less than \$250 thousand.

Uncertainty Issues

This MTRU waste is to be shipped back to the Rocky Flats DOE site where it will be prepared to meet the Waste Acceptance Criteria for WIPP, provided WIPP is granted a no-migration determination from EPA. Because of the small volume of this waste stream, it should be consolidated with the TRU material at Rocky Flats for treatment and packaging. Transportation of this waste stream to Rocky Flats for treatment raises issues to be addressed by affected state agencies (e.g., receiving state and corridor states) and their stakeholders.

CHAPTER 5 HIGH LEVEL WASTE STREAMS

Section 5.1 Aqueous Liquids

Section 5.1A.1 221-F Canyon High-Level Liquid Waste

5.1A.1 GENERAL INFORMATION

Waste Stream Number: SR-W016

The preferred treatment option for 221-F Canyon High-Level Liquid Waste is High-Level Waste Vitrification in the Defense Waste Processing Facility (DWPF). The low-level portion of this waste stream will be separated via In-Tank Precipitation (ITP) and stabilized at the Z-Area Saltstone Facility.

Background Information:

This waste is an aqueous liquid containing fission products generated from the 221-F Canyon facility in support of the PUREX Process. F-Canyon waste materials are generated from the extraction of plutonium from reactor targets and other feed stock.

Volume

- Current volume through 09/30/93 is 54,160 m³.
- Expected 1993-1997 volume will be 7350 m³.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D002C (corrosive high-level waste), D005B (high-level waste Ba), D007B (high-level waste Cr), D008D (high-level waste Pb), D009F (high-level waste Hg), D011B (high-level waste Ag)
- nonwastewater slurry

LDR Treatment Standard

- Specified technology = Vitrification of high-level mixed radioactive wastes

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based on availability of analysis, with the exception of TCLP.

Radiological Characterization

- Total activity for radiological characterization is 6.81 Ci/gal.
- Alpha emitters (U²³⁵, U²³⁸, Pu²³⁹, Pu²⁴⁰, Pu²⁴¹, Am²⁴¹, Cm²⁴¹) and beta/gamma emitters (Sr⁹⁰, Ru¹⁰⁶, Zr⁹⁵, Nb⁹⁵, Rh¹⁰⁶, Cs¹³⁷, Ce¹⁴⁴, Pr¹⁴⁴, Pm¹⁴⁷, H³).
- Waste is remote handled.
- High-level waste.

5.1A.1.2 TECHNOLOGY AND CAPACITY NEEDS

Vitrification is the specified technology for all of the waste codes in SRS high-level wastes. These wastes are generated during the reprocessing of fuel rods.

5.1A.1.3 TREATMENT OPTION INFORMATION

The high-level waste tanks in F- and H-Areas currently store almost 130,000 m³ of salt solution, saltcake and sludge generated mostly from the dissolution of target assemblies

irradiated in the SRS reactors. It is expected that an additional 13,500 m³ of high-level liquid waste from both F- and H-Canyon will be generated at SRS in the next five years. The treatment schedule prioritizes the removal of waste from tanks that are at most risk. These are the single-walled tanks and tanks that have only a partial secondary containment structure.

The total volume of high-level liquid waste is not treated at DWPF. Waste from the separations facilities are sent to the high-level waste tank farm, and are kept in a tank for a minimum of one year to allow short-lived, highly radioactive isotopes to decay. The waste solution is then sent to an evaporator to reduce the volume placed in storage. Evaporator overheads from concentrating the salt waste in the tank farms are treated and released via the F and H ETF. The ITP process is designed to convert the soluble salts into an insoluble precipitate in solution which is filtered to separate the solid precipitate from the liquid solution. The liquid filtrate is transferred to Tank 50 which is the feed tank for the Z-Area Saltstone Manufacturing and Disposal Facility. The resulting precipitate slurry is transferred to the DWPF Vitrification Facility.

Thorough research has been performed on the best technology for treating the high-level liquid waste in a manner that generates a waste form that has the greatest stability over the longest period of time and is the most highly resistant to both the chemical and radiological nature of the waste. Borosilicate glass has been determined to be the best stabilization matrix and also represents the specified technology identified by EPA for the high-level waste stream.

The DWPF will be able to process 100 kg of borosilicate glass per hour. At a 75% rate of operation, DWPF is expected to process approximately 190,000 kg of high-level liquid waste per year.

DWPF is operated under an industrial wastewater permit. Since the DWPF was first designed, several modifications have been proposed and are in various stages of development. These include In-Tank Precipitation (ITP), Saltstone Processing and Disposal, Extended Sludge Processing, the Late-Wash Facility addition, nitric acid introduction, ammonia mitigation modification, hydrogen modifications, and benzene treatment. TCLP tests of simulated high-level wastes were done on both 1) levels in the range of expected wastes to be processed in DWPF, and 2) at three times the level of metals expected. These tests indicated that the waste form produced at DWPF will remove the hazardous characteristics (reference WSRC-IM-91-116-13, Rev. C). SRS is re-evaluating the DWPF through a Supplemental Environmental Impact Statement to assess any additional environmental risks in light of these modifications. The results of this reassessment could dictate additional modification in the design or operation of the DWPF.

5.1A.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Budget re-evaluation for DWPF activities is currently ongoing.

Uncertainty Issues

Applicability of additional evaluation under NEPA creates uncertainty related to budget and schedule for this treatment option.

5.1A.2 221-H Canyon High-Level Liquid Waste

5.1A.2.1 GENERAL INFORMATION

Waste Stream Number: SR-W017

The preferred treatment option for 221-H Canyon High-Level Liquid Waste is High-Level Vitrification in the Defense Waste Processing Facility (DWPF). The low-level portion of this waste stream will be separated via In-Tank Precipitation (ITP) and stabilized at the Z-Area Saltstone Facility.

Background Information:

This waste stream is an aqueous liquid containing mixed fission products from the H-Canyon facility in support of the modified PUREX process. The stream also contains decontamination solution from maintenance activities in the H-Area High-Level Waste Tank Farm. H-Canyon waste materials are generated from the recovery of enriched uranium from fuel tubes.

Volume

- Current volume through 09/30/93 is 74,180 m³.
- Expected 1993-1997 volume will be 6,220 m³.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D002C (corrosive high-level waste), D005B (high-level waste Ba), D007B (high-level waste Cr), D008D (high-level waste Pb), D009F (high-level waste Hg), D011B (high-level waste Ag)
- nonwastewater slurry

LDR Treatment Standard

- specified technology = Vitrification of high-level mixed radioactive wastes

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based on availability of analysis, with the exceptions of TCLP.

Radiological Characterization

- Total activity for radiological characterization is 37.8 Ci/gal.
- Alpha emitters (U²³⁵, U²³⁸, Pu²³⁹, Pu²⁴⁰, Pu²⁴¹, Am²⁴¹, Cm²⁴¹) and beta/gamma emitter (Sr⁹⁰, Ru¹⁰⁶, Zr⁹⁵, Nb⁹⁵, Rh¹⁰⁶, Cs¹³⁷, Ce¹⁴⁴, Pr¹⁴⁴, Pm¹⁴⁷, H³).
- Waste is remote handled.
- High-level waste

5.1A.2.2 TECHNOLOGY AND CAPACITY NEEDS

Vitrification is the specified technology for all of the waste codes in SRS high-level wastes. These wastes are generated during the reprocessing of fuel rods. Since DWPF is designed for only high-level wastes at SRS capacity should not be a concern.

5.1A.2.3 TREATMENT OPTION INFORMATION

The high-level waste tanks in F- and H-Areas currently store almost 130,000 m³ of salt solution, saltcake and sludge generated mostly from the dissolution of target assemblies irradiated in the SRS reactors. It is expected that an additional 13,500 m³ of high-level liquid

waste from both F- and H-Canyon will be generated at SRS in the next five years. The treatment schedule prioritizes the removal of waste from tanks that are at most risk. These are the single-walled tanks and tanks that have only a partial secondary containment structure.

The total volume of high-level liquid waste is not treated at DWPF. Waste from the separations facilities are sent to the high-level waste tank farm, are kept in a tank for a minimum of one year to allow short-lived, highly radioactive isotopes to decay. The waste solution is then sent to an evaporator to reduce the volume placed in storage. Evaporator overheads from concentrating the salt waste in the tank farms is treated and released via the F and H ETF. The ITP process is designed to convert the soluble salts into an insoluble precipitate in solution which is filtered to separate the solid precipitate from the liquid solution. The liquid filtrate is transferred to Tank 50 which is the feed tank for the Z-Area Saltstone Manufacturing and Disposal Facility. The resulting precipitate slurry is transferred to the DWPF Vitrification Facility.

Thorough research has been performed on the best technology for treating the high-level liquid waste in a manner that generates a waste form that has the greatest stability over the longest period of time and is the most highly resistant to both the chemical and radiological nature of the waste. Borosilicate glass has been determined to be the best stabilization matrix and also represents the specified technology identified by EPA for the high-level waste stream.

The DWPF can process 100 kg of borosilicate glass per hour. At a 75% rate of operation, DWPF is expected to process approximately 190,000 kg of high-level liquid waste per year.

DWPF is operated under an industrial wastewater permit. Since the DWPF was first designed, several modifications have been proposed and are in various stages of development. These include In-Tank Precipitation (ITP), Saltstone Processing and Disposal, Extended Sludge Processing, the Late-Wash Facility addition, nitric acid introduction, ammonia mitigation modification, hydrogen modifications, and benzene treatment. TCLP tests of simulated high-level wastes were done on both 1) levels in the range of expected wastes to be processed in DWPF, and 2) at three times the level of metals expected. These tests indicated that the waste form produced at DWPF will remove the hazardous characteristics (reference WSRC-IM-91-116-13, Rev. C). SRS is re-evaluating the DWPF through a Supplemental Environmental Impact Statement to assess any additional environmental risks in light of these modifications. The results of this reassessment could dictate additional modification in the design or operation of the DWPF.

5.1A.2.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Budget re-evaluation for DWPF activities is currently ongoing.

Uncertainty Issues

Applicability of additional evaluation under NEPA creates uncertainty related to budget and schedule for this treatment option.

Section 5.1B Organic Debris

5.1B.1 Mixed Sludge Waste from DWPF Treatability Studies

5.1B.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W058

The preferred treatment option for the Mixed Sludge Waste from DWPF Treatability Studies waste stream is pretreatment as 90-day generator at SRTC followed by vitrification.

Background Information:

This waste stream consists of high-level waste supernate, sludge, and salt samples from the tank farm and mercury contamination generated during DWPF treatability studies. The waste mercury sludge has dried and caked onto eight centrifuge tubes and a glass bottle. The waste is stored in a satellite accumulation area metal can in a shielded cell at SRTC. The waste stream was reported incorrectly as mixed low-level waste in the final Mixed Waste Inventory Report; it is actually high-level waste. Because of the very small volume of this waste stream (actual volume – 0.0003 m³), SRTC intends to develop a process flowsheet that would illustrate options for treating the waste within 90 days under the “containment building” rule. The possible alternatives include acid dissolution followed by mercury separation as a pretreatment, with aqueous waste going to the High-Level Waste Tank Farm for processing in the DWPF or for vitrification directly in the SRTC test melter. If high-level vitrification is not the preferred process for this small quantity of waste, SRS will need to request DHEC to approve the regulatory discretion of an alternative treatment.

Volume

- Current volume through 09/30/93 is 0.1 m³.
- No future waste generation expected; one time generation.

Waste Stream Composition

- Organic debris – glass

Waste Code

- D009F – (high-level waste Hg) nonwastewater

LDR Treatment Standard

- Specified technology = Vitrification of high-level mixed radioactive wastes

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high.

Radiological Characterization

- Beta/gamma emitter Cs¹³⁷, Eu¹⁵⁴ and Sr⁹⁰.
- Activity level > 10,000 nCi/g
- Waste is remote handled.
- High-level waste.

5.1B.1.2 TECHNOLOGY AND CAPACITY NEEDS

The process flowsheet for the preferred option is shown above. The D009F waste code for this waste stream has a specified technology of vitrification of high-level mixed radioactive waste.

This waste is presently stored in a satellite accumulation area and is a very small volume. The preferred treatment option involves crushing the material, solubilizing the waste in acid, filtering the solids (glass) and sending the liquid portion through an ion exchange resin to remove the mercury. The liquid exiting the resin column would be sent to the High-Level Waste Tank Farm and eventually be vitrified. The filtered glass would be disposed as radioactive waste since the hazardous constituent had been removed.

5.1B.1.3 TREATMENT OPTION INFORMATION

Option Support Justification – IDOA Performed

- Treatment capacity exists at the Savannah River Technology Center that has demonstrated capability to effectively treat the waste stream.
- Treatment at the satellite location requires remote handling of the waste, thus reducing worker exposure risk
- Treatment at the satellite area (and in a 90-day containment building) eliminates permit requirements.

Regulatory Status

Since the waste is in a satellite accumulation area, the waste can be treated in a 90-day accumulation area, administered under RCRA sec. 262.34, without a permit.

5.1B.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Budget impact for treating this waste stream should be minimal and administered as a part of the SRTC operating budget.

The estimated cost to treat this waste stream is less than \$400 thousand.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream at this time.

Section 5.1C Organic Sludges and Particulates

5.1C.1 Mixed Waste to Support High-Level Waste Processing Demonstrations

5.1C.1.1 GENERAL INFORMATION

Waste Stream Number: SR-W050

The preferred treatment option for the Mixed Waste to Support High-Level Waste Processing Demonstrations is pretreatment in the "SRTC 90-day Containment Building" by Neutralization, Chemical Oxidation, and Ion Exchange. Residues from this pretreatment will be vitrified.

Background Information:

Formerly described in the Conceptual Site Treatment Plan and the Interim MWIR as In-Tank Precipitation Samples, this waste is generated by laboratory research, development and analytical programs at the SRTC to support the DWPF operations. Waste comes from demonstrations of the DWPF and ITP process samples to support DWPF operations.

Volume

- Current volume through 09/30/93 is 0.1 m³.
- Expected 1993-1997 volume will be 0.4 m³.

Waste Stream Composition

- Organic Sludge/Particulate

Waste Code

- D007B (high-level waste Cr), D009F (high-level waste Hg), D018 (benzene) nonwastewater
- Typical contaminant levels = 0.1 mg/l Cr, 10 mg/l Hg

LDR Treatment Standard

- Specified technology is vitrification of high-level mixed radioactive wastes.
- D018 = no treatment standard yet developed by EPA

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high because analysis was performed on simulants to indicate waste characterization.

Radiological Characterization

- Total activity is <1000 uCi/g.
- Beta/gamma emitter and Cs¹³⁷ and Sr⁹⁰ present.
- Waste is remote handled.
- High-level waste.

5.1C.1.2 TECHNOLOGY AND CAPACITY NEEDS

This waste has a specified technology of high-level vitrification. The benzene component does not yet have a treatment standard promulgated by EPA.

This waste stream is a combination of lab waste generated from DWPF Tank Farm analyses and lab waste to be generated in the future from routine quality assurance/quality control activities to be performed by SRTC for the ITP Facility. The existing SRTC 90-day Containment Building will be utilized to carry out the preferred treatment option. Budgeting will be a routine part of the normal operating activities for SRTC.

The future samples will originate at the ITP Facility during a pretreatment step in preparing the high-level liquid waste for vitrification at the DWPF. Because of the source of the waste, these samples are highly radioactive and require remote handling. In addition, once the samples have been collected and the QA/QC testing completed, there is no practical and safe method of reintroducing them into the tank farm or the ITP Facility without pretreatment to dissolve the precipitated solids and render it RCRA non-hazardous. SRTC can further treat these samples by neutralization, chemical oxidation, and ion exchange to meet the LDR standards and offer proper protection to workers with its remote handling equipment and shielded laboratories. Residues from this pretreatment will be vitrified.

5.1C.1.3 TREATMENT OPTION INFORMATION

Regulatory Status

Such treatment action is done in the SRTC 90-day containment building in which the waste is treated within 90 days of the generation date. Notification of the intent to treat in containment building was provided to EPA Region IV on August 6, 1992.

5.1C.1.4 TREATMENT OPTION STATUS AND UNCERTAINTIES

Budget Status

Costs for operating the SRTC 90-day Containment Building for processing the mixed waste to support high-level waste processing demonstrations is \$23.2K per year. This figure is based on processing one batch per month, using 16 operator hours for the process, facility, and costs of chemicals.

The estimated cost to treat this waste stream is less than \$100 thousand.

Uncertainty Issues

No significant uncertainties (technical, budgetary, permitting, etc.) are identified or anticipated for this waste stream at this time.

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CHAPTER 6 FUTURE GENERATION OF MIXED WASTE STREAMS

This chapter addresses waste streams which are not currently addressed in a data record of the Mixed Waste Inventory Report and did not undergo any in-depth options analysis. The section explains the types of waste to be generated in future activities at SRS and the general estimates of those waste volumes.

Section 6.1 Environmental Restoration Waste

The SRS Environmental Restoration (ER) Mission is to clean up inactive waste sites and decommission surplus facilities to ensure that the environment and the health and safety of people are protected. The SRS has implemented a comprehensive environmental program to maintain compliance with environmental regulations and mitigate impacts to the environment. This program will be accomplished over a 30-year period. ER activities at SRS are governed by the Federal Facility Agreement (FFA). The FFA is a tri-party agreement between DOE, EPA and SCDHEC, which became effective on August 16, 1993. The FFA requires that SRS set work priorities on an annual basis with schedules and deadlines for environmental restoration actions. These priorities will be negotiated and updated each year. SRS must also submit to EPA and SCDHEC long term projections including projected deliverable dates for work activities to be conducted over the next two fiscal years and Record of Decision (ROD) dates for the third fiscal year and beyond. Other ER activities are defined by RCRA permit, closure and groundwater corrective action requirements, settlement agreements and consent orders. Known mixed wastes for which a cleanup decision is scheduled within the next five years and for which treatment in accordance with the RCRA LDRs may be required, are identified below for general planning purposes. Due to the uncertainty of how these environmental restoration wastes ultimately will be managed, their inclusion into the Plan Volume of this STP (and therefore the specification of how and when they will be treated) will not occur until a final cleanup decision (i.e., CERCLA ROD or equivalent document) has been reached. This final decision will be made in compliance with applicable statutory/regulatory requirements and, where appropriate, established schedules in existing compliance agreements/orders.

One element of the ER program is the investigation of waste units. Environmental investigations typically employ activities such as drilling and excavating, which produce investigation by-products. These by-products may include purge water, drill cuttings, drilling fluids, well development water, decontamination solutions, and personal protective equipment (PPE). In cases where investigations confirm the presence of contamination and the by-products contain wastes in concentrations high enough to be of environmental or health concern, special management procedures are warranted. The term used by the EPA for these potentially contaminated by-products is Investigation Derived Waste (IDW).

An Investigation Derived Waste Management Plan is under development to describe how IDW generated during characterization and assessment activities will be managed. Two programs exist under this management plan; management of IDW derived from listed hazardous waste sources and management of IDW derived from non listed sources. For those wastes derived from listed hazardous waste sources, finalization of this section of the management plan will be contingent upon promulgation of a proposed rule regarding petitions for "contained-in" determinations so that environmental media may be excluded from management as a hazardous waste. The EPA "contained-in" policy requires media which contains a listed hazardous waste to be managed as if it were a hazardous waste. IDW from non listed sources is categorized as purge water resulting from groundwater sampling or investigation by-products resulting from waste site investigation activities. Purge water from individual wells with constituent concentrations (hazardous and radiological, with the exception of tritium) exceeding 10 times the established health based levels (HBLs) will be containerized and treated at existing SRS treatment facilities such as the F/H ETF. Solid and slurry by-products, including contaminated PPE, from investigation activities with constituent concentrations exceeding proposed RCRA Subpart S action levels, will be

managed as IDW at the waste unit within the area of contamination (AOC) until remediation or dispositioning under a final ROD. A flowchart illustrating the IDW management strategy is shown in Figure 6.1. Implementation of the IDW Management Plan as written should result in little or no mixed waste generation.

In addition to IDW, ER activities could generate remediation wastes. These wastes would be generated during closure or restoration of inactive waste units, or during groundwater corrective action. Contaminated soil, waste pits, and groundwater are the focus of many remedial actions. A variety of contaminated soil, sludge, and liquids will result from cleanup activities such as excavation, dredging, and pumping at these sites. Many remediation sites are currently in the assessment phase, so the nature and extent of contamination has not yet been defined. In addition, detailed information on the specific cleanup activities that may be applied to the various contamination problems is not yet available, so the resultant waste that could be generated cannot yet be reliably determined. In fact, the plans for many remediation sites have not yet advanced to the stage where even the broad category of response is known. For example, the decision on whether a given contaminated area such as a waste pit is to be excavated or stabilized in place is not typically made until after the nature of the problem has been adequately defined, various response alternatives and related impacts have been evaluated in considerable detail, and other agencies (EPA and SCDHEC) and the local community have had a chance to comment on the preferred alternative. If characterization activities identified both radioactive and hazardous contaminants in the pit, it is possible that mixed waste could be generated if the pit were excavated, whereas no waste would be generated if the pit were capped in place. Thus, early volume estimates for mixed waste associated with this pit are uncertain because of the nature of the remedial action process.

Even in those cases where the decision has already been made and specific activities have advanced beyond the conceptual planning stage, the information needed to support a reasonable estimate of resultant waste volumes is still generally unavailable. For example, a site may already have conducted bench-scale and pilot-scale testing for a given water treatment system, and scale-up and construction may have been completed, but key data such as the operating efficiencies of its individual components, including pretreatment and post-treatment processes, cannot be known until the actual treatment is well under way. Similarly, the contaminant concentrations of the effluents cannot be reliably known until the system is in full use, so the specific nature of the treatment residuals that may be produced over the next five years cannot be reliably determined.

Because this information is not available for ER, the waste inventories and projections in this report are based on generally conservative assumptions. These estimates will continue to be updated as cleanup activities progress at the individual sites and the appropriate information becomes available. Since detailed waste stream information is not currently available for environmental restoration activities, future mixed waste generation data has been estimated. The estimates are given in the attached table. The identification of new mixed waste streams resulting from ER activities will occur after a decision document such as a ROD, RCRA closure plan approval, or RCRA Part B permit, for the waste unit.

These same limitations inherent to the cleanup process also preclude the provision of certain detailed data that was broadly requested for the FFCAct. This request presumed detailed knowledge of waste streams, such as EPA waste codes and specified LDR treatment technologies. That information is not available for the ER program. For most sites the contamination has not yet been fully characterized and the specific activities, including treatment, that may be conducted have not yet been finalized. Therefore, insufficient detail is available to assign waste codes or other specific identifiers to environmental restoration waste projections. This is in contrast to waste streams being generated by operating facilities, which have been well characterized and for which specific descriptors and treatment technologies can be provided.

For the reasons discussed above, the volumes projected for the ER sites are estimates only. A good faith effort has been made to estimate the volume of such wastes. Nevertheless, in most cases, DOE is in the early stages of characterizing the wastes and identifying areas of contamination. Thus, the projection of mixed waste volumes subject to LDR that will require management by the sites will likely change as the remedial process advances. The volume of mixed waste that is subject to LDR varies according to the remedy selected; for example, in situ treatment will not generate mixed waste that will require treatment capacity to be developed.

It has not yet been determined how the ER wastes, particularly wastes which are to be addressed under existing enforceable cleanup agreements, will be reflected in the final site treatment plan. DOE will continue discussions with the states and EPA to address this matter.

Mixed waste expected to be generated by ER actions are listed in the SRS LDR Federal Facility Compliance Agreement (LDR FFCA). Mixed waste generation estimates as developed for the WM-EIS planned case are listed in Table 6.1.1 at the end of this section. Since planning is not complete for fiscal years beyond 1996, no information is available on the source locations. This information is compiled from the most recently estimated volumes of mixed waste. It has purposefully been made conservative. For example, purge water is listed as a future mixed waste, although purge water is IDW and is expected to be managed according to the IDW Management Plan, which will result in little or no mixed waste generation.

The values presented in Table 6.1.1 must be caveated as preliminary estimates because of the nature of the ER program. Without comprehensive data on contaminant types and concentrations combined with operational information for specific response actions, the types and volumes of waste that will be generated can only be roughly estimated. Table 6.1.1 supplies an estimate and projection of mixed waste that may be generated by SRS ER activities. These values have been adjusted and updated. They represent a change in the information provided in the MWIR.

Figure 6.1 – Investigation Derived Waste Management Strategy

Table 6.1.1 – Estimated Mixed Generation at Environmental Restoration Sites

Calendar Year	Source Location	Waste Stream	EPA Waste Code/Isotopes	Volume
1994	Burial ground complex	Soil samples, clothing	Metals, analysis needed/ Am^{241} , Cd^{137} , Cs^{137} , Pu^{238} , Sr^{90} , U^{235} , H^3	80 m ³ total waste stream volume for the year
	Burial ground monitoring wells	Purge water	Analysis needed/ U^{238} , Cs^{137} , H^3	
	Old burial ground solvent tanks	Sludge, soil, equipment, tools, clothing	Metals and organics/many isotope types	
	L-Area Oil & Chemical Basin	Sludge, soil, clothing, tools	Organics, analysis needed/ U^{235} , U^{238} and other fission by-products	
	Misc. other waste units	Purge water and IDW soils/solids	analysis needed	980 m ³
1995	Burial ground monitoring wells	Purge water	Analysis needed/ U^{238} , Cs^{137} , H^3	50 m ³ total waste stream volume for the year
	Old burial ground solvent tanks	Sludge, soil, equipment, tools, clothing	Metals, organics/many isotope types	
	Separations Equipment Development Lab	to be determined	Metals/ Pu^{239} , U^{235}	
	Misc. other waste units	Purge water and IDW soils/solids	analysis needed	
				847 m ³
1996	Burial ground monitoring wells	Purge water	Analysis needed/ U^{238} , Cs^{137} , H^3	50 m ³ total waste stream volume for the year
	Old burial ground solvent tanks	Sludge, soil, equipment, tools, clothing	Metals, organics/many isotope types	
	Separations Equipment Development Lab	to be determined	Metals/ Pu^{239} , U^{235}	
	Misc. waste units	Purge water and IDW soils/solids	analysis needed	
				592 m ³
1997	to be determined	to be determined	to be determined	60 m ³ (estimated and extrapolated from previous years)
	Misc. waste units	Purge water and IDW soils/solids	analysis needed	
				610 m ³
1998	Misc. waste units	Purge water and IDW soils/solids	analysis needed	638 m ³

Section 6.2 Decommissioning and Decontamination (D&D) Waste

A modest increase in decommissioning (D&D) of facilities at the Savannah River Site was initiated in Fiscal Year 1994 using funds that could not be utilized by other programs. This is expected to continue in Fiscal Year 1995 and beyond, although the only D&D projects that are budgeted are for the Separations Equipment Development (SED) Laboratory in the Savannah River Technology Center and for surveillance and maintenance of the Heavy Water Components Test Reactor (HWCTR). A small quantity of mixed waste was included in the estimate for SED, mainly as a conservative measure. The HWCTR activity is not expected to generate any mixed waste.

The new work initiated in Fiscal Year 1994 included preliminary decommissioning work on the 232-F Tritium Facility and the 230-H Beta-Gamma Incinerator. This work is not in the current budget plan, but if funding for these projects becomes available, and decommissioning proceeds, mixed waste will be generated. The mixed waste from 232-F could include mercury, oil contaminated with tritium, and radioactively contaminated lead. The Beta-Gamma Incinerator was a demonstration unit used to incinerate contaminated solvents and other material. Some of the residual contamination will be mixed waste. Neither of these facilities has been characterized, and waste estimates are based on limited information.

The other new D&D project initiated in Fiscal Year 1994 involved dismantling surplus auxiliary buildings that had no radioactive contamination but contained asbestos in transite panels and minor quantities of lead. It is expected that this type activity will continue in Fiscal Year 1995 and beyond. Some possible candidate buildings for FY95 were included in the waste estimate which include buildings that have radioactive contamination. It was considered prudent to include some mixed waste generation in these estimates on the basis that whenever radioactive contamination is present there will probably be some mixed waste. The buildings that were included in the estimate are only representative of the buildings that might be selected if funding becomes available. The type of mixed waste can not be estimated at this time, and the waste volumes are best guesses.

As noted, all of the D&D activities beyond SED and HWCTR are contingent on opportunistic funding. None are budgeted to date. When a specific project is funded, walkdowns and initial characterization work will be done to generate the best estimate of the volume and nature of mixed waste that could be generated. This information will be used to update the Site Treatment Plan.

Section 6.2 is based upon the D&D Waste Generation Forecast completed by the SRS Systems Engineering Department. The forecast is presently a draft with no major changes to be expected. The D&D Forecast covers a thirty year time period. However, only a five year forecast is included to be consistent with other DSTP information.

The five year estimate is based on buildings that are in the current D&D Initiatives Plan, supplemented with a potential list of additional buildings that might be decommissioned by the year 1999.

The five year estimates are rough because they are based primarily on building floor areas and contaminants listed in the Surplus Facility Inventory Assessment data base that assumed waste volumes per unit area, as opposed to data from drawings and facility inspections. There is no apparent funding for D&D of most of these facilities, i.e., those beyond the near term D&D Initiatives Plan. This is all the information available. Systems Engineering will update the forecasts as better information becomes available.

The five year forecast and assumptions have been taken from the Westinghouse Savannah River Company Thirty Year D&D Waste Generation Forecast for Facilities at SRS (WSRC-RR-94-496).

Assumptions

1. The Surplus Facilities Inventory Assessment (SFIA) database is accurate. Facility floor area and general characterization information were used to arrive at the waste estimates presented.
2. For the five year period 1995 through 1999, facilities will be decontaminated and decommissioned to the degree that all buildings/facilities included will be removed unless otherwise specified in this report. For the years 2000 through 2004, it is expected the majority of the nonradiological facilities will be decontaminated and decommissioned to Greenfield and the radiological facilities will be D&D to an extent determined on a case-by-case basis with future industrial use taken into consideration.
3. All facilities will be in a safe condition prior to decontaminated and decommissioned (i.e., all nuclear fuel or liquid waste will have been removed, systems flushed, and drained).
4. All surplus chemicals (including fuel/lubricants) stored in facilities will be drained/removed prior to D&D, and therefore, are not included in this estimate.
5. Residual chemicals are considered to be RCRA hazardous.
6. Salvage/reuse of equipment was considered only if mentioned in the SFIA database for a particular facility. Salvageable equipment volume was estimated at 15% of the total possible waste volume.
7. Volume reduction (including compaction and treatment) and recycling are not considered in this estimate.
8. For radiological facilities, the estimate includes removal of two feet of soil beneath the facility slab, only if the facility is completely decontaminated and decommissioned. Of the removed soil, 15% is assumed to be low-level radioactive waste. The remaining 85% is assumed to be free of any contamination (radiological and hazardous) and suitable for backfill.
9. For facilities with storage tanks (either above ground or below), the estimate includes minor to moderate soil removal if: 1) The SFIA database reported releases to soil as "unknown" and/or 2) There is a reason to believe the tanks could have leaked (such as the tanks are old, are single shell carbon steel, etc.). Removed soil from a nonradiological facility is assumed to be hazardous waste.
10. Concrete rubble cannot be singled out in this estimate due to SFIA database limitations. No recycling of nonradioactive concrete rubble is considered.
11. Waste volume estimates were rounded to the nearest 10 cubic feet.
12. Groundwater remediation is not considered in this estimate.
13. All asbestos and asbestos containing material volumes are identified as TSCA waste, regardless of contamination level (i.e., low-level radioactive asbestos volumes will be reported as TSCA waste, not low-level waste). If a facility had low-level TSCA waste, the percentage of low-level waste content was identified in the following tables. Note the "TSCA" column in these tables present total TSCA waste. Any low-level TSCA waste was not added to the "LLW" column.

14. For Pu^{238} production/processing facilities (e.g., old 221-HB-Line), approximately 43 ft³ of solid waste per square foot of contaminated floor area is generated by D&D. Of this, approximately 50% is TRU waste (i.e., 21 ft³); the rest is low-level waste (LLW). Less than 500 ft³ is mixed waste (primarily lead shielding) per 5000 ft² of area.
15. For Pu^{239} processing facilities (e.g., old 221-FB-Line, SED facility), approximately 13 ft³ of TRU waste is generated per square foot of contaminated floor area. Assume LLW waste volume is 1.25 times greater than the TRU waste volume.
16. For Pu^{238} and Pu^{239} production/processing facilities, assume the contaminated floor area is equal to the facility floor area.
17. Nonradiologically contaminated (clean) administrative facilities (offices, guardshacks, etc.) are empty facilities, i.e., all furniture, partitions, computers, office supplies, etc. have been removed. (Note: Nonradiologically contaminated facilities have TSCA and/or hazardous contamination.)
18. Empty mobile (trailer) administrative space will generate 3 ft³ of D&D waste per ft² of floor area.
19. Empty administration space (with foundation) will generate 6 ft³ of D&D waste per ft² of floor area (Greenfield D&D).
20. Storage warehouses will be de-inventoried prior to D&D.
21. Empty, nonradiologically contaminated (clean) storage warehouses (> 15 foot ceilings) will generate 8 ft³ of D&D waste per ft² of floor area (Greenfield D&D).
22. Process/production facilities and their support facilities (other than Pu^{238} and Pu^{239} processing facilities, and administrative facilities) will generate 12 ft³ of D&D waste per ft² of floor area (Greenfield D&D).
23. Identification of waste categories generated is based on the SFIA database general characterization information. If a waste category is listed in the SFIA database, in most cases volumes are estimated as follows:
 - I. Nonradiological Facility
 - a) TSCA waste = 20% of total waste volume
 - b) Hazardous waste = 15% of total waste volume
 - c) Sanitary waste = 100% – (TSCA + Hazardous)
 - II. Radiological Facility

Percentages are estimated for the clean and contaminated areas of the facility. For the clean percentage, waste volumes are estimated following I above (for most cases). No "formula" has been developed for the radiological percentage, except that if a radiological facility contains hazardous material(s), a percentage of this quantity is assumed to be mixed waste. The estimated percentage of mixed waste would depend on what fraction of the facility is estimated to be contaminated. TRU waste is included in an estimate only if transuranic isotopes are mentioned in the SFIA record for the facility. The remaining radiological waste is then assumed to be low-level waste (low-level waste = 100% – (Mixed + TRU)).
24. No reactors will be completely D&D during this period. The thick reinforced concrete center sections of Reactors R, P, L, K, and C Areas will remain in place along with the stack and support structure, the reactor and shielding, and the disassembly basins. The

- heat exchangers, main process pumps, and most of the stainless steel piping will be removed for the metal recycle program.
25. All pre-D&D activities generating waste by facility operations are not included in this waste estimate.
 26. Lowest cost surveillance and maintenance (S&M) will include additional removal of hazardous and radioactive materials as part of reducing S&M hazards and costs. Limited facility dismantlement may also be accomplished to reduce S&M costs and reduce occupational risk.
 27. D&D work will be driven by available funding. This report assumes funding will be available in the year the facility is forecasted for D&D.
 28. In the 30-year period the following facilities will not undergo D&D:
 - Defense Waste Processing Facility (DWPF)
 - Z-Area Saltstone Facility
 - Effluent Treatment Facility (ETF)
 - In Tank Precipitation (ITP) Facility
 - Savannah River Technology Center (SRTC; except for SED Facility)
 - Replacement Tritium Facility
 - Type III Waste Tanks
 - New Special Recovery Facility of 221-FB-Line
 - 484-D Powerhouse Facility, 483-1D Water Treatment Facility and support buildings
 - Burial Ground Facilities
 29. High-level waste tanks to be D&D, i.e., Type I, II, and IV, will be closed in place. These tanks will be de-inventoried prior to turnover to D&D. D&D will remove and stabilize residual wastes. Associated equipment and small buildings will be removed. Underground transfer piping, diversion boxes, etc. will remain in place.
 30. Process sewer line removal and remediation is an ER responsibility.
 31. All surplus powerhouse facilities will be sold in place to a salvage operator and removed from SRS.
 32. Ten percent of the total waste estimate is incinerable waste.
 33. The culvert fraction of TRU waste is 4 percent of the total TRU waste volume generated.
 34. Canyon Building 221-F and 221-H will be de-inventoried and cleaned up with the building structures to remain.

Detailed 5-Year D&D Waste Generation Forecast

The following tables present the SRS D&D waste generation forecast for the years 1995 through 1999. The 5-year forecast was developed from consideration of wastes generated from D&D of 53 facilities. Identification of the facilities to be D&D and the D&D timeframe was provided by the Transition Decontamination and Decommissioning (TD&D) Department. The above assumptions apply to this forecast. To convert from cubic feet to cubic meters, multiply the cubic feet by 0.028.

1995 Bldg. No.	A R E A	Building Name	Cubic feet Sanitary	Cubic feet TSCA	Cubic feet HAZ	Cubic feet LLW	Cubic feet MIXED	Cubic feet TRU
232	F	Manufacturing Bldg. (Tritium)* (C)	20230	21380(a)	10110	35920	37560	0
230	H	Demonstration Waste Incinerator (C) (b)	2310	2150**	920	4620	6600	0
109	R	Purge Water Storage Tank*	360	0	60	1110	190	0
122	R	Heavy Water Storage Building *	11250	8250#	2250	33000	6750	0
151-1	R	Electrical Distribution Building	53820	16560	12420	0	0	0
151-2	R	Electrical Distribution Building	105300	32400	24300	0	0	0
152	R	Electrical Transformer Near 701-3R	2730	840	630	0	0	0
191	R	Standby Pumphouse	2890	890	670	0	0	0
704	R	Administration Building	73500	18000(c)	15750	40500	2250	0
		TOTALS-YEAR 1995	272390	100470	67110	115150	53350	0

* estimate includes soil removal beneath building

(a) approximately 90% of this value is low-level TSCA waste

(b) estimate includes minor soil removal due to existence of fuel UST; estimate includes equipment removal and building decon only

** approximately 67% of this value is low-level TSCA waste

approximately 80% of this value is low-level TSCA waste

(c) approximately 13% of this value is low-level TSCA waste

1996 Bldg. No.	A R E A	Building Name	Cubic feet Sanitary	Cubic feet TSCA	Cubic feet HAZ	Cubic feet LLW	Cubic feet MIXED	Cubic feet TRU
232	F	Manufacturing Bldg. (Tritium) (a)	20230	21380-	10110	35920	37560	0
230	H	Demonstration Waste Incinerator (b)	2310	2150	920	4620	6600	0
773	A	SED Facility F-055, F-057 F-151	0	400	0	48750	500	39000
701-1	C	Area Gatehouse	9750	3000	2250	0	0	0
701-2	C	Exclusion Area Fence Entry Point	9580	0	500	0	0	0
704	C	Area Administration & Service Bldg. *	45000	18000	13500	0	0	0
151-1	C	Electrical Substation	18250	5620	4210	0	0	0
151-2	C	Electrical Substation	18250	5620	4210	0	0	0
295	F	Stack for Building 232-F	0	0	0	1340	1340	0
		TOTALS-YEAR 1996	123370	56170	35700	90630	46000	39000

* assume 13500 ft³ (15%) of salvageable equipment per SFIA

(a) estimate includes soil removal beneath building

(b) estimate includes minor soil removal due to existence of fuel UST; estimate includes equipment removal and decon only

1997 Bldg. No.	A R E A	Building Name	Cubic feet Sanitary	Cubic feet TSCA	Cubic feet HAZ	Cubic feet LLW	Cubic feet MIXED	Cubic feet TRU
105-7	C	Change Building *	480	0	30	0	0	0
608	C	Change Facility	370	110	90	0	0	0
183-2	C	Water Clarification Facility (a)	15600	4800	4200	0	0	0
183-3	C	Water Clarification Diesel Gen. (b)	1870	0	1330	0	0	0
183-4	C	Water Clarification Support Facility (a)	18950	5830	5100	0	0	0
190	R	Cooling Water Pumphouse #	78000	24000	18000	0	0	0
186	R	Cooling Water Basin (25 Mgal)**	390000	120000	90000	0	0	0
412-5	D	Shelter and Shop Building	3510	1080	810	0	0	0
		TOTALS-YEAR 1997	508780	155820	119560	0	0	0

* assume 90 ft³ (15%) of salvageable equipment per SFIA

(a) estimate includes soil removal beneath building

(b) estimate includes minor soil removal due to existence of diesel storage tank

** estimate includes equipment removal only

estimate includes above grade D&D only

1998 Bldg. No.	A R E A	Building Name	Cubic feet Sanitary	Cubic feet TSCA	Cubic feet HAZ	Cubic feet LLW	Cubic feet MIXED	Cubic feet TRU
607-1	C	Sewage Lift Station #1	280	0	20	0	0	0
607-2	C	Sewage Lift Station #2	250	0	50	0	0	0
607-7	C	Sewage Treatment Facility	15600	0	2750	0	0	0
607-9	C	Sewage Chemical Feed Building	3210	0	570	0	0	0
184-2	C	Powerhouse Support Facility *	2520	1010	880	0	0	0
191	C	Booster Pump Building	5300	0	940	0	0	0
105-1	C	Basin Deionizer Pad**	15300	0	2700	9000	1800	1800
108-3	C	Fuel Oil Loading Station	7	0	4290	0	0	0
904-1	C	Cooling Water Effluent Sump	0	0	0	5530	0	840
110	C	Helium Storage Tanks	1870	1660	430	0	0	0
152	C	Electrical Substation	3160	970	730	0	0	0
		TOTALS-YEAR 1998	47490	3640	13360	14530	1800	2640

* assume 760 ft³ (15%) of salvageable equipment per SFIA; estimate includes oil removal beneath building

** estimate includes soil removal beneath building

1999 Bldg. No.	A R E A	Building Name	Cubic feet Sanitary	Cubic feet TSCA	Cubic feet HAZ	Cubic feet LLW	Cubic feet MIXED	Cubic feet TRU
152-5	C	Secondary Substation for 707-C	2110	650	490	0	0	0
152-6	C	Secondary Transfer Station for 702-C	2340	720	540	0	0	0
152-7	C	Security Emergency Generator *	2350	0	480	0	0	0
184-6	C	Equipment Storage	3260	0	580	0	0	0
501	C	Emergency Generator *	1840	0	380	0	0	0
711	C	Maintenance Material Storage Bldg.	10400	3200	2400	0	0	0
186-1	C	Sodium Hypochloride Addition Facility	7650	0	1350	0	0	0
109	C	Purge Water Storage Tank	740	0	0	2310	0	0
614-2	C	Effluent Monitoring Building	1840	0	320	0	0	0
701-4	C	Shelter for Security Equipment	4560	0	240	0	0	0
706-8	C	Modular Office (Trailer)	10000	0	1760	0	0	0
706-9	C	Modular Office (Trailer)	10000	0	1760	0	0	0
704-3	C	Modular Office (Trailer)	5130	0	270	0	0	0
715	C	Gasoline Station (a)	600	0	1700	0	0	0
190	C	Cooling Water Pumphouse (b)	89700	27600	20700	0	0	0
186	C	Cooling Water Basin (25 Mgal) **	450000	120000	30000	0	0	0
715	L	Gasoline station (a)	600	0	1700	0	0	0
715	P	Gasoline station (b)	270	0	1320	0	0	0
		TOTALS-YEAR 1999	603390	152170	65990	2310	0	0

* estimate includes minor soil removal due to uncertainty in SFIA

(a) estimate includes moderate soil removal due to existence of fuel UST

(b) estimate includes above grade D&D only

** estimate includes equipment removal only

Section 6.3 Additional Waste Streams Identified after the May 1994 MWIR Data Report

The following waste streams were identified after the Final Mixed Waste Inventory Report (Final MWIR) was published and will be included in the next MWIR update. Options for treatment will be explored and presented in the Final Site Treatment Plan during February 1995.

SR-W060 Tritiated Water with Mercury

This waste stream went into LDR storage prior to the May 8, 1992, effective date for mixed waste D009, but was inadvertently missed in the MWIR.

Closer analysis during the DSTP revealed the waste was not counted in the established MWIR waste stream SR-W015, Mercury Contaminated Equipment, as presumed. This waste,

resulting from a one-time weld failure of a thermal diffusion column in the 232-H Tritium facility, consists of 17 liters of tritiated water (with approximately 13,200 Ci), contaminated with 3 to 4 droplets of mercury (D009A) and absorbed on 112 lbs. of silicon gel (total volume = 0.2 m³). The waste is contained in a specially fabricated, welded, stainless steel container and has been in permitted storage (643-29E) since October 19, 1989. The high tritium content complicates the use of standard wastewater treatment for this waste.

SR-W061 DWPF Off-Specification Mercury

This is a potential future waste stream which may be produced during the recovery of mercury from the DWPF vitrification of high-level waste. The mercury will be recovered as elemental mercury as a part of the DWPF process and will be sold and shipped offsite for use in commercial applications. There may be very small amounts of this product that will not meet the radiological specifications for sale and will need to be treated and disposed of as waste (D009D waste code).

Since the process has not begun operation, the concentrations of radionuclides in the salable mercury has not been proven. Based on laboratory results and calculations, expected concentrations have been determined for the salable product; however the level at which the mercury cannot be sold has not been determined. The LDR treatment standard for elemental mercury with radioactive materials is amalgamation and scenarios for onsite amalgamation treatment and offsite treatment will be examined. For waste reporting and treatment capacity purposes, assume 0.5 m³/yr for this off-specification mercury will be generated by DWPF starting in 1995.

SR-W062 Mercury Contaminated Debris - Sitewide

This is a future waste stream of mercury contaminated debris (pipes, equipment, recorders, transite, etc.) that will be generated sitewide; mainly from transition and D&D activities. For waste reporting and treatment capacity purposes, assume 10 m³ for 1994, 1050 m³ for 1995, and 1050 m³ for 1996. (1995 & 1996 estimates based on D&D projections of mixed waste generation for the 232-F and SED projects. This may be overly conservative since the mercury debris is not distinguished from the other generated mixed waste.)

SR-W063 Macroencapsulated Lead

This is a future waste stream anticipated to be generated in 1995 - 1996 by the dismantling and removal of various equipment (D008C) used in handling high-level waste in the SRS Tank Farms. Counterweights from jumpers, valves with lead shielding and a steel covered jumper box are examples of these inherently hazardous waste forms, by initial analysis, would naturally meet the lead treatment standard of macroencapsulation. In 1995-1996, 14 m³ are anticipated from the H-Tank Farm operations, but additional waste of this kind may be generated sitewide by future maintenance or transition activities.

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CHAPTER 7 STORAGE

DOE is committed to storing waste in compliance with RCRA storage requirements in 40 CFR 264 or 40 CFR 265 pending the development of treatment capacity and implementation of the Site Treatment Plan.

For mixed waste to be shipped offsite for treatment, storage before and after treatment will be arranged on a case-by-case basis between the shipping and receiving sites, in consultation with the affected states. Factors such as inadequate compliant storage capacity at the shipping site and the need to facilitate closure of the shipping site will be considered in proposing shipping schedules.

The Savannah River Site (SRS) currently operates several mixed waste storage facilities that are operated in accordance with the hazardous waste management regulations promulgated by the Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC). The EPA established a framework for the proper management of hazardous waste by promulgating the regulations contained in 40 CFR 260-270. These regulations implement Subtitle C of the Resource Conservation and Recovery Act (RCRA). South Carolina has obtained authorization from the EPA to implement the South Carolina Hazardous Waste Management Regulations (SCHWMR) R.61-79.260-270 in lieu of the majority of federal regulations promulgated by the EPA in 40 CFR 260-270. There are some exceptions to the SCDHEC's authority to implement the hazardous waste program in South Carolina so the Savannah River Site (SRS) must comply with the EPA and SCDHEC's environmental regulations depending on the delegation of authority. For the purposes of this document, compliance with the EPA regulations that South Carolina has not received authority for are included in the discussions concerning compliance with the SCHWMR unless it is stated otherwise.

Each onsite, mixed waste storage facility at the SRS complies with the SCHWMR. For the most part, facilities under interim status meet the minimum state standards of the SCHWMR R.61-79.265, while permitted facilities meet the final facility standards of SCHWMR R.61-79.264 and the specific requirements outlined in the facility's RCRA Part B Permit. Both categories of facilities must comply with future regulations adopted by the EPA or the SCDHEC.

The F- and H-Area Tank Farms which receive high-level waste (HLW) generated by operations at the Savannah River Site, are permitted under the Clean Water Act rather than RCRA. The F- and H-Area Tank Farms are permitted under Industrial Wastewater Permits 17,424-IW and 14,520-IW.

Due to a lack of treatment capacities for mixed wastes, a Federal Facility Compliance Agreement for the land disposal restrictions (LDR-FFCA) was entered into by the EPA-Region IV and the Department of Energy (DOE) to provide a period for the SRS to construct and operate treatment facilities for the prohibited mixed wastes. The wastes covered by the LDR-FFCA are presently stored, or will be generated in the future, stored, and treated, by the operation of the facilities at the SRS, in accordance with the LDR-FFCA. The specific mixed wastes and quantities that can be generated are specified in the agreement. The LDR-FFCA formalizes a plan for the mixed waste treatment facilities and includes schedules, permitting requirements, and compliance issues. The LDR-FFCA has been modified through a bridging amendment to cover the period of time until October 1995 when the Site Treatment Plan consent order under the Federal Facility Compliance Act (FFCA) of 1992 is signed and becomes effective.

Section 7.1 Existing SRS Mixed Waste Storage Capacity

Mixed waste at SRS is stored in various facilities on the site. Mixed waste is categorized as either mixed low-level waste (MLLW), mixed TRU waste, or high-level waste (HLW). These

three types of mixed wastes are not stored in the same facilities. The following two sections discuss the storage provisions for mixed low-level waste and mixed TRU waste. High-level waste (HLW) is stored at SRS in the F- and H-Area Tank Farms. Section 7.1.3 discusses the storage HLW at the F- and H-Area Tank Farms.

7.1.1 Mixed Low-Level Waste (MLLW)

7.1.1.1 MLLW Permitted and Interim Status Storage

The following facilities are currently in use or planned for MLLW storage (Building 643-43E is completed but not yet operational). These facilities have either been approved for interim status under RCRA Part A or permitted by a RCRA Part B permit.

Mixed Low-Level Waste – Container Storage

- Mixed Waste Building 645-2N in the Hazardous Waste Storage Facility in N-Area
- Mixed Waste Storage Building 643-29E in E-Area
- Mixed Waste Storage Building 643-43E in E-Area
- Mixed Waste Storage Shed 316-M in M-Area
- TRU Pads 6-13 in E-Area

Please note that the Experimental Transuranic Waste Assay Facility/Waste Certification Facility is not included as it is not currently in use. It is being modified at this time. In addition, it is not intended to be a long term storage facility. Waste is to be only temporarily stored there while it is assayed and x-rayed.

The CIF container and tank storage areas are not included as they are not currently in use. These areas are currently being constructed. In addition, these areas are not intended to be long term storage facilities. Waste will be temporarily stored in these areas while it is awaiting incineration, storage, disposal at appropriate facilities.

Mixed Low-Level Waste – Tank Storage

- Process Waste Interim Treatment Storage Facility in M-Area
- DWPF Organic Waste Storage Tank in S-Area
- SRL Mixed Waste Storage Tanks at SRTC
- Burial Ground Solvent Tanks S23-S30 and Liquid Waste Solvent Tanks S33-S36

Each of these storage facilities is described in Section 7.1.1.3, Description of MLLW Facilities. Table 1, titled, "Mixed Low-Level Waste" provides the current storage capacities and the storage permit status (RCRA Interim Status; or Part B Permitted) for each of these storage facilities.

Please note that Burial Ground Solvent Tanks S-23-S30 are planned to undergo closure, and will be replaced by new tanks S33-S36. A revision to the RCRA Part A has been submitted requesting Liquid Waste Solvent Tanks S33-S36 to be added to the RCRA Part A. During the closure of tanks S23-S30, wastes will be transferred to tanks S33-S36, and the total volume of waste in Liquid Waste Solvent Tanks S33-S36 shall not exceed the current RCRA Part A capacity of 200,000 gallons. After certification of closure of the Burial Ground Solvent Tanks the SRS will submit a revision to the RCRA Part A changing the capacity of the Burial Ground Solvent Tanks S23-S30 to zero and the Liquid Waste Solvent Tanks S33-S36 to 200,000 gallons or less.

Table 1 – Mixed Low-Level Waste – Container Storage Capacity

Facility Name	Storage Area	Location	RCRA Status	Storage Capacity* Volume in Gallons (Cubic Meters)
Hazardous Waste Storage Facility	Mixed Waste Building N-Area	645-2N	B	153,780 (582)
Mixed Waste Storage Building	E-Area	643-29E	A	31,750 (120)
Mixed Waste storage Building	E-Area	643-43E	A	309,375 (1171)
Mixed Waste Storage Shed	M-Area	316-M	A	30,800 (117)
TRU Pads	E-Area	Pads 6-13	A	N/A**

TOTAL 525,705
(1990)

Mixed Low-Level Waste – Tank Storage Capacity

Facility Name	Storage Area	Location	RCRA Status	Storage Capacity* Volume in Gallons (Cubic Meters)
Process Waste Interim Treatment	M-Area	PWIT/SF	A	2,195,730 (8,311)
DWPF Organic waste Storage Tank	S-Area	430-S	A	150,000 (568)
SRL Mixed Waste Storage Tanks	SRTC	772-2A	A	52,310 (198)
Solvent Tanks Burial Ground Solvent Tanks	E-Area	S23-30	A (to be closed) requested (new construction)	200,000 (757)
Liquid Waste Solvent Tanks	H-Area	S33-36		

TOTAL 2,598,040
(9,834)

*This capacity is that allowed by Part A or Part B

**As part of the plan for interim waste storage, all MLLW will be removed from the TRU pads. Therefore the TRU pads are shown to have no MLLW capacity.

7.1.1.2 Stored Mixed Low-Level Waste Inventory

The inventory of waste currently stored in each of these facilities is given in Table 2, titled, "MLLW Stored Inventory and Excess Capacity." These stored volumes, subtracted from the capacities listed in Table 1, result in the excess capacities listed in the Table 2.

Table 2 – MLLW Stored Inventory and Excess Capacity

Mixed Low-Level Waste – Container Storage

Facility	Stored Inventory in gallons (cubic meters)	Excess Storage Capacity in gallons (cubic meters)
Mixed Waste Building 645-2N	147,356 (557.7)	6,424 (24.3)
Mixed Waste Storage Bldg. 643-29E	16,396 (62.1)	15,354 (58.1)
Mixed Waste Storage Bldg. 643-43E	0 (0)	309,375 (1171.0)
Mixed Waste Storage Shed 316-M	7,353 (27.8)	23,447 (88.8)
TRU Pads 6-13	347,520 (1315.4)	N/A*

Mixed Low-Level Waste – Tank Storage

Facility	Stored Inventory in gallons (cubic meters)	Excess Storage Capacity in gallons (cubic meters)
Process Waste Interim Treatment/Storage Facility	408,453 (1546.0)	1,787,277 (6764.9)
DWPF Organic Waste Storage Tank**	0 (0)	150,000 (567.8)
SRL Mixed Waste Storage Tanks	39,340 (148.9)	12,970 (49.1)
Burial Ground Solvent Tanks***	28,296 (107.1)	171,704 (649.9)

*As part of the plan for interim waste storage, all MLLW will be removed from the TRU pads. Therefore the TRU pads are shown to have no MLLW capacity.

** Operational, but the waste being stored is not mixed. This facility will not begin storing mixed waste until DWPF begins processing radioactive waste.

*** Available storage capacity is limited to Tanks S29 and S30 (50,000 gallons total capacity, 21,704 gallons excess capacity) due to secondary containment requirements precluding use of Tanks S23-S28.

7.1.1.3 Description of MLLW Facilities

Building 645-2N

Building 645-2N is part of the Hazardous Waste Storage Facility (HWSF) and is used only for storage of MLLW.

Building 645-2N is a steel framed building with sheet metal siding and an impervious concrete slab-on-grade floor. The floor is subdivided into four storage cells. Each cell has a concrete dike containment system capable of containing at least 10 percent of the maximum volume of wastes containing free liquids which the cell can store. In addition, each cell slopes to a 300-gallon (1.1 m³) capacity sump located in each cell.

Access to Building 645-2N within the chain link fence surrounding the N-Area HWSF is controlled by the Custodian, Waste Management Operations. The building has lighting and forced ventilation. The security fence gate is locked when operations are not occurring within the building.

Building 643-29E

Building 643-29E is used for storage of Mixed Low-Level Waste. The building is designed and constructed as a curbed, concrete pad covered by a metal framed building. The building is constructed of steel I-beam frames with a sheet metal roof and partial sheet metal siding. The building measures 60 feet x 60 feet with a 50 feet x 50 feet storage pad area.

The pad is curbed and includes a concrete sump to collect any leaks so that any liquids found in the sump can be checked for radioactivity. Waste stored in the building is packaged in drums, large steel boxes (typically B-25 type), and concrete casks used as shielding overpacks to reduce dose rate. Other containers, including special design containers, may also be used occasionally.

Building 643-43E

Building 643-43E is designated for storage of Mixed Low-Level Waste. In general, the building is nearly identical in design to building 643-29E. Building 643-43E measures 160 feet X 60 feet overall with a 150 feet X 50 feet storage pad area. Building 643-43E is located in close proximity and just east of Building 643-29E.

The concrete pad within the building is curbed and includes a sump to collect any leaks and any liquids found in the sump so that they can be checked for radioactivity and RCRA constituents.

Waste to be stored in the building is contained in 55-gallon drums (0.2 m³), large steel boxes (typically B-25 type), and concrete casks used as shielding overpacks to reduce dose rate. Other containers, including specially-designed containers, may also be used occasionally.

Building 316-M

The Mixed Waste Storage Shed, Building 316-M is used for storage of mixed low-level waste. The building measures 120 feet x 50 feet. The storage area of the building is 100 feet x 40 feet.

The concrete pad within the building serves as the storage area and it is curbed on three sides. The fourth side of the pad is elevated to ensure positive drainage to 12 static sumps within the pad. An interior curb divides the pad into halves, each half having six sumps. The sumps are divided into sets of three, which are connected. Liquids found in the sumps can be checked for radioactivity and RCRA constituents.

Waste stored in the building is packaged in 55-gallon (0.2 m³) drums and large steel boxes (typically B-25 type). Other containers, including specially-designed containers, may also be used occasionally.

Process Waste Interim Treatment/Storage Facility (PWIT/SF)

The PWIT/SF consists of six treatment/storage tanks each with a capacity of 35,955 gallons (136.1 m³) and four treatment/storage tanks each with a capacity of 495,000 gallons (1873.6 m³).

The six small tanks are on a single diked pad. The tanks have sufficient shell strength and are fitted with vents and conservation vent valves to assure that they do not collapse or rupture. The base is free of cracks or gaps and is sufficiently impervious to contain liquid materials until they can be removed. The base slopes to a sump which drains and collects accumulated liquid materials for testing and removal. The dike can contain the volume of any individual tank plus an additional capacity of 165,945 gallons (628.1 m³). The pad is protected from rain water run-on by diking and a roof and full siding which covers all of the

treatment/storage tanks and the pad. The tanks are elevated so they are protected from contact with accumulated liquids. The overflow for each tank is within the diked area.

The large tanks are covered double wall tanks with sufficient shell strength and pressure reliefs to assure that they do not collapse or rupture. The annulus volume of the tanks is sufficient to contain any leak through the inner wall and valving enables accumulated liquid materials to be tested and removed from the annulus. The bases of the tanks are reinforced concrete free of cracks and gaps. Each tank will overflow to one of the other tanks.

DWPF Organic Waste Storage Tank

The DWPF Organic Waste Storage Tank has a capacity of 150,000 gallons (567.8 m³). The tank is constructed of 304-L stainless steel and is approximately 35 feet in diameter. It has a double-seal internal floating roof and a fixed dome roof. A full height carbon steel outer vessel serves as secondary containment. The outer vessel has a roof to exclude rainwater, and continuous liquid leak detection.

The tank vapor space is inerted with nitrogen gas to prevent ignition. Foam injection nozzles are installed in the primary and secondary tanks for fire suppression. An emergency vent, which relieves to the atmosphere, prevents over-pressure of the tank in case of an external fire.

SRL (SRTC) Mixed Waste Storage Tanks

There are ten radioactive liquid waste tanks identified as Tanks A-H, J & K. They are located below grade in an underground vault. Tanks A-G each have a capacity of 5,900 gallons (22.3 m³) and are 10 feet in diameter x 11 feet high. Tanks H, J & K each have a capacity of 3,670 gallons (13.9 m³) and are 8 feet in diameter x 11 feet high. All tanks are constructed of 0.5 inch stainless steel in accordance with the American Society of Mechanical Engineers (ASME) Codes for unfired pressure vessels. The tanks are located in concrete vaults. The exterior walls of the vaults are 12 inches thick with 18-inch thick partition walls between adjacent vaults.

Each tank is equipped with an agitator, a sampling system and a dip line extending to about one inch above the tank bottom. The dip line is used for transferring waste material from the tank. The tanks are agitated for sampling and during waste transfer operations. After a tank is emptied, a liquid heel of approximately 50 liters remains in the bottom of the tank. Each tank has an internal wash jet such that liquid can be circulated internally and sprayed for washdown.

Solvent Tanks

Each of the eight Burial Ground Solvent Tanks, S23-S30, are 10 feet 6 inches in diameter by 38 feet 10 inches long and have a capacity of 25,000 gallons (94.6 m³). Each tank is constructed of 3/8 inch carbon steel with three coats of bitumastic paint applied for corrosion protection.

Each tank rests on four steel saddles that are on top of a concrete slab that slopes to the center and to one end. At the low end is a fully bituminous-coated 60 gallon (0.2 m³) stainless steel sump which is designed to collect any liquid which may escape from the tank. A 30 millimeter (mil) polyvinyl chloride (PVC) oil resistant liner was placed in the excavations for S29 and S30 before the slabs and tanks were installed.

Tanks S23-S28 have a seamless six mil polyethylene liner that was placed over them before backfilling. Additionally, two seamless oil resistant 20 mil sheets of PVC were placed over tanks S23-S30 before approximately 2'6" of soil overburden were placed over them. Following

this the area over each tank was asphalted. These measures minimize rainwater infiltration from coming in contact with the tanks, thus reducing the potential of corrosion.

The Liquid Waste Solvent Tanks S33-S36 will be used to replace, or partially replace the capacity currently permitted for the Burial Ground Solvent Tanks S23-S30 as discussed in Section 7.1.1.1. The RCRA Part A revision that SRS has submitted to include tanks S33-S36 on the RCRA Part A describes the tanks as four buried, double-walled tanks with nominal capacities of 30,000 gallons. Each tank will be constructed of carbon steel and will be provided with corrosion protection, a leak detection system, leak collection sump, overfill protection, waste agitation pumps, single filtration system, and inspection ports.

The number and/or capacity of each liquid waste solvent tank may increase, but the total capacity for the Liquid Waste Solvent Tanks will not exceed 200,000 gal.

7.1.2 Mixed TRU Waste

Mixed TRU waste is stored on 17 storage pads at the burial ground in the E-Area. The 17 storage pads are included in the RCRA Part A permit for the SRS. TRU Pads 1-5 are covered with soil and managed as a RCRA Subpart X Miscellaneous Unit while TRU Pads 6-17 are managed as a Container Storage Unit.

Storage containers on the pads consist mainly of 55-gallon (0.2 m³) carbon steel and galvanized steel drums. Other containers include concrete culverts that contain 55-gallon (0.2 m³) drums and other small polyboxes, carbon steel boxes and steel and concrete casks.

7.1.2.1 Mixed TRU Waste Storage

Storage Pads 1-17 have been granted Interim Status to store an aggregate of 4,631,000 gallons (17,528 m³) of mixed TRU waste. The pads were permitted incrementally as the need for storage space evolved over time as follows:

Pads 1-5	1,111,000 gallons	(4,205.1 m ³)
Pads 6-13	2,035,000 gallons	(7703.0 m ³)
Pads 14-17	<u>1,485,000 gallons</u>	<u>(5,620.7 m³)</u>
TOTAL	4,631,000 gallons	(17,528.3 m ³)

In 1989, the SRS was granted a variance from a portion of the South Carolina Hazardous Waste Management Regulations (SCHWMR), R.61-79.265.35 and 265.173(c) and (d) for Pads 6-13. These sections of the regulations describe the requirements for aisle spacing and labeling of Container Storage Areas. A Conditional Variance from aisle spacing requirements of SCHWMR R.61-79.265.35 for containers stored on TRU pads 14-17 was granted to the SRS on June 2, 1993. The Conditional Variance was issued to the SRS through December 31, 1998, after which time all containers on Pads 14-17 must meet the aisle space requirements.

In March 1989, the SRS discovered that rainwater had infiltrated some of the drums stored on the storage pads via filter vents. Subsequently, in February of 1991, the SRS submitted a dewatering plan to the South Carolina Department of Health and Environmental Control (SCDHEC) that outlined a procedure for dewatering the drums. The SRS is dewatering the TRU drums and the drums are being appropriately labeled and stored on enclosed TRU Pads 14-17.

The storage pads are addressed in the LDR-FFCA. These documents describe how the containers used for storage of LDR mixed waste on the pads will be managed. The agreements discuss what sump contents will be analyzed for, the configuration of waste containers on the pads, how the pads will be inspected and how the waste containers on the pads will be labeled.

7.1.2.2 Mixed TRU Waste Stored Inventory

The inventory of mixed waste stored on Pads 6-17 is 1,663,500 gallons (6,296.4 m³). Of this stored volume 347,520 gallons (1,315.4 m³) is MLLW and 1,316,000 gallons (4,981 m³) is mixed TRU waste.

The excess capacity is 1,856,500 gallons (7,026.9 m³) and is exclusive of TRU Pads 1-5. This amount of apparent excess capacity is less than the actual excess capacity for mixed TRU waste by 1,315.4 m³ of MLLW stored on the TRU pads. Relocating the MLLW to an approved MLLW storage area would provide a mixed TRU waste excess capacity of 2,204,020 gallons (8,342.2 m³).

7.1.2.3 Description of Mixed TRU Waste Storage Pads

TRU Pads 1-6 are located in the southeastern tip of the 643-7E Burial Ground and each has been filled with containerized TRU waste. Pads 1-5 and part of Pad 6 have subsequently been covered with 3 feet of fill-dirt, a synthetic liner, a foot of fill-dirt, and 6 inches of topsoil with grass seed (Pensacola Bahai). Pads 1-4 also are coated with an asphaltic spray (for erosion control). Mounding over the pads provides shielding for the stored radionuclides and protection of the waste forms from nature and intrusion.

The remaining TRU Pads, 7-17 are not covered by dirt and are not expected to be covered because of the impending startup of a Federal repository. TRU Pads 7-13 are located adjacent to each other in the northeastern corner of the 643-7E Burial Ground, and TRU Pads 14-17 are located adjacent to each other in the center of the 643-7E Burial Ground.

Each of the 17 pads is sloped to the center and to one end. This directs any liquid to a drain which is connected to a sump. The liquid in each sump is sampled, analyzed, and, if there is any radioactive contamination, it is removed by pumping and managed accordingly.

TRU Pads 14-17 are roofed with a structural enclosure system. Similar enclosures are planned for other pads. The purpose of the enclosures is to protect stored waste drums from rain until treated and disposed. Because the enclosures will be used in a regulated zone and will be associated with radioactively contaminated waste, they will be disposed of as low-level waste after serving their function.

Salient features of the enclosures are 1) leak proof roof with ultraviolet light protection (Ledlar or equivalent), 2) high wind load resistance, and 3) no center supports.

7.1.3 High-Level Waste (HLW)

The F- and H-Area Tank Farms contain waste tanks and evaporator systems that manage and treat the high-level radioactive wastewater generated by operations at the Savannah River Site. These HLW waste streams are generated at several different sources and are introduced into the Tank Farms at several different locations. HLWs are produced during reprocessing of spent nuclear fuel or are derived from other processes which handle HLWs. The tanks and evaporator systems in the F- and H-Area Tank Farms receive fresh wastes, allow radioactive decay by waste aging, provide primary clarification by gravity settling, and remove dissolved salts by evaporation. The F- and H-Area Tank Farms operate under Industrial Wastewater permit number 17,424-IW, with the exception of Tank 50 which operates under Industrial Wastewater permit number 14,520-IW.

7.1.3.1 HLW Storage

The F- and H-Area Tank Farms are currently permitted under Industrial Wastewater permits to store HLW. The Tank Farms are described in Section 7.1.3.3, Description of F- and H-Area Tank Farms.

7.1.3.2 HLW Stored Inventory

The inventory of HLW in storage in the F and H Tank Farms is 130,581 m³ as of June 1994. The excess available capacity is 4,133 m³. This capacity does not take into account dedicated capacity for emergency storage and processing of HLW for final disposal or space in the Type I or II tanks which cannot receive additional HLW, or the Type IV tanks which are used to store only low activity waste.

7.1.3.3 Description of F- and H-Area Tank Farms

The F- and H-Area HLW Tank Farms contain waste tanks and evaporator systems to manage and treat the high-level radioactive wastewaters generated by the SRS operations. The above units function to receive fresh wastes, allow radioactive decay by waste aging, provide preliminary clarification by gravity settling, and remove dissolved salts by evaporation. The treated wastewater (overheads from the evaporator systems) is transferred to the F/H ETF for final treatment prior to discharge to Upper Three Runs Creek. Mercury is recovered from the wastewater and collected for potential recycle/reuse within the SRS separations processes.

The H-Area HLW Tank Farm also contains process units to treat the accumulated sludges and salts. The sludge processing operation is designed to prepare the sludges for transfer to the DWPF Vitrification Facility. The ITP process is designed to convert the soluble salts into an insoluble precipitate in solution which is filtered to separate the solid precipitate from the liquid solution. The liquid filtrate is transferred to Tank 50 which is the feed tank for the Z-Area Saltstone Manufacturing and Disposal Facility. The resulting precipitate slurry is transferred to the DWPF Vitrification Facility.

The F-Tank Farm contains 22 tanks and the H-Tank Farm contains 29 tanks. However, due to a history of leakage, Tank 16, a Type II tank, has been removed from service and is not included in this discussion.

The total storage capacity for the F- and H-Tank Farms is 35.1 million gallons (132,854 m³). This storage capacity is based on the total space available in the Type III/IIIA tanks. The excess storage capacity is obtained by subtracting the current waste inventory contained in the Type III/IIIA tanks from the total available storage capacity.

Tank Type	Area	No. of Tanks	Capacity (M/gallons)
I*	F	8	0.75
I*	H	4	0.75
II*	H	3	1.03
III/IIIA	F	10	1.3
III/IIIA	H	17	1.3
IV*	F	4	1.3
IV*	H	4	1.3

* These tanks do not meet secondary containment criteria as described in the FFA and are therefore not used to calculate the total and excess storage capacity. However, these tanks currently contain waste that has been included in the current waste inventory.

The design of each of the four types of waste tanks was based on the best available professional engineering judgment, proposed use, and progressive operating experience. In general, the Type I waste tank design consists of a primary tank made of carbon steel. Surrounding the primary tank is a five-foot-high carbon steel secondary pan. The annulus

pan has a leak detection system consisting of conductivity probe to detect liquid and a liquid level bubbler. The secondary pan is enclosed by a concrete vault, which also surrounds the entire primary tank. Type I tanks have a nominal storage capacity of 750,000 gallons (2,838.7 m³).

The Type II tanks are also made of carbon steel with a five-foot-high annulus pan, surrounded by a concrete vault and provided with leak detection. Type II tanks have a 1,030,000 gallon (3,898.5 m³) nominal storage capacity.

The primary tanks of Type III/IIIA tanks are constructed of carbon steel. Each primary tank is surrounded by a full-height carbon steel secondary tank that is capable of containing the complete volume of the primary tank. The secondary tank is provided with leak detection. Type III/IIIA tanks have a nominal storage capacity of 1,300,000 gallons (4,920 m³).

Each of the Type IV tanks is basically a carbon steel-lined prestressed concrete tank with a domed roof. Leak detection for these tanks is provided by a grid of channels in the concrete foundation under the tank that drain to a sump outside the periphery of the tank wall. Type IV tanks are not equipped with a steel annulus pan or full steel secondary tanks. The nominal storage capacity for Type IV tanks is 1,300,000 gallons (4,920 m³).

Section 7.2 Future Storage Capability Needs for SRS Wastes

Requirements for future storage capability for MLLW and mixed TRU waste are being determined by studies that are currently in progress. These studies include a detailed evaluation of future generation of these two types of wastes, an assessment of the current storage configurations and storage capabilities and an estimation of what additional storage facilities will be required. The study of TRU waste began in late 1993 and initially focused on current storage needs. This study has progressed further than the companion study of MLLW, which was only recently initiated. Results and conclusions from these studies will not be available until approximately September 1994.

The quantities of future waste generation presented in the following paragraphs are presently the best estimates available. The need for provisions for additional storage areas for both types of wastes are tentative until the above studies are complete. The action to gain interim status for specific existing potential storage areas as discussed in Paragraph 7.2.2, however, is proceeding to support current storage needs.

The information provided in Section 7.2.3, High-Level Waste, concerning future waste generation is based on the current best estimate available. The generation of HLW, therefore the capacity required to store it, may change drastically as missions of facilities producing HLW change.

7.2.1 Mixed Low-Level Waste

Future MLLW projections for 1993 through 1997 are shown in Table 3. This table also includes the present excess capacity from Table 2 for comparison. This table shows that there is sufficient excess storage capacity for the solid MLLW storage facilities to accommodate present storage needs and storage for future waste generation through the five year period of 1993 through 1997.

For all practical purposes, Building 645-2N is presently used to capacity and can accommodate little or no additional waste. All of the storage area in building 643-29E is presently used and cannot accommodate any additional waste. The 31,750 gallon capacity listed in Table 2, "MLLW Stored Inventory and Excess Capacity," for Building 643-29E is based on 210 55-gallon drums and 30 90-ft³ boxes being stored. This calculation does not take into account other containers, such as concrete culverts and specially designed boxes, that are currently stored in Building 643-29E. The presence of such odd shaped containers explains why

Building 643-29E is noted as full when 15,354 gallons remain in its RCRA Part A permit capacity (denoted as Excess Storage Capacity in Table 2).

The mixed waste storage shed 316-M has about a quarter of its capacity utilized and can accommodate additional waste for storage.

Building 643-43E will provide the largest storage facility. Operational status is not expected until as late as December 1994. Once operational, however, it has a large capacity for storage.

The plan for interim waste storage includes removal of the 347,520 gallons (1315.4 m³) of solid MLLW from TRU Pads 6-13 to a MLLW storage facility to restore this storage area to mixed TRU waste. Achieving interim status capacity of 450,000 gallons (1703 m³) for Pads 20-22 (see discussion in Paragraph 7.2.2) is expected, after which this waste could potentially be relocated to Pads 20-22. Also, obtaining interim status capacity of 600,000 gallons (2271 m³) for the M-Area Pad (316-4M) will provide storage of 200,000 gallons (757 m³) of M-Area stabilized sludge and 400,000 gallons (1514 m³) of CIF stabilized ash and blowdown.

These actions, however, are being reviewed in an on-going study and the ultimate disposition of this waste to alternate storage has not been decided upon at this time but will be forthcoming from that study.

The low-level waste currently stored in tanks is shown in Table 3 by individual storage area. Processes for treatment of these wastes are planned for implementation and will progressively diminish the volumes of waste currently stored and generated in the future. Consequently the inventory in the tanks will vary with time and will be the result of a balance between waste processing rate and rate of future generation of waste such that the established capacities are not exceeded.

Table 3 – MLLW Future Generation and Excess Capacity

Waste Type	Excess Capacity in Cubic Meters (From Table 2)	5-Year Future Generation in Cubic Meters	Capacity After 5 Years in Cubic Meters
<u>Mixed Low-Level Waste Container Storage</u>			
Aggregate of existing facilities	1,342.2	108 - a	1234
Pad 316-4M	1514	1380-b	134
<u>Mixed Low-Level Waste Tank Storage</u>			
Process Waste Interim Treatment Storage Facility	6,764.9	490.1	c
DWPF Organic Waste Storage Tank	567.8	380	d
SRL Mixed Waste Storage Tanks	49.1	750	d
Burial Ground Solvent Tanks and Liquid Waste Solvent Tanks	649.9	0	e

- a 5-year forecast for newly generated wastes
- b 5-year forecast for M-Area Vendor and CIF treatment residuals. Volumes represent the treated wasteforms, i.e., vitrified M-Area sludge and stabilized CIF ash and blowdown.
- c The inventory of the Process Waste Interim Treatment Storage Facility will change as the treatment process for the M-Area sludge begins. The stored volume in the tanks will not exceed the permitted capacity for the tanks, however the volume will continue to fluctuate until the treatment process of the M-Area sludge is completed.
- d The inventory in the DWPF OWST and SRL MWST will change with time as treatment processes begin and therefore the volume stored will be a continuously changing quantity. The treatment processes and future generation will be well coordinated so as to ensure that the stored volumes do not exceed capacity.
- e Refer to Section 7.1.1.3 for a discussion concerning how the permitted capacity for the Solvent Storage Tanks will be transferred from the Burial Ground Solvent Tanks to the proposed Liquid Waste Solvent Tanks.

7.2.2 Mixed TRU Waste

The first phase of the study to identify the quantity of waste currently stored in mixed TRU waste facilities in comparison to available interim status capacity has recently been completed. The results show that the amount of stored waste is less than the interim status capacity although the storage area on Pads 1-17 is largely occupied. Presently, some of the pads have a mix of various types of storage containers and are nearly full while others have some remaining storage area. These wastes are not presently arranged in storage arrays with aisle spacing.

The SCDHEC permitting process for Pads 14-17 requires that aisle spacing be incorporated in the waste container stored arrays for emergency access (i.e., for fire fighting, spill cleanup, etc.) and that aisle spacing be fully incorporated on these four pads by December 31, 1998. To provide the intended access to waste containers SRS plans to incorporate aisle spacing, as appropriate, for all waste containers on these storage pads.

An evaluation was made to determine the impact of aisle spacing on the amount of available storage area in the waste container arrays on Pads 1-17 to determine the amount of storage area required in the aisle spaced configuration. It was determined that to accommodate the currently needed mixed TRU waste storage area with aisle spacing approximately 17 3/4 pads would be needed. This pad requirement accounts for retrieval of drums from TRU Pads 2-5 (retrieved drums would be repacked into 0.3 m³ overpack drums). The 17 3/4 pads is additionally based on LLMW on Pads 6-13 and some of the non-mixed TRU waste being relocated to other appropriate storage areas. Thus to accommodate current mixed TRU waste storage needs additional storage beyond the permitted 17 pads is required once aisle spacing is implemented.

Retrieval of drums on Pads 2-5 is not scheduled to begin until 1997 and completion of aisle spacing containers on Pads 14-17 is not required until December 1998. The fact that these actions are not imminent and are of a progressive nature allows for the study of future mixed TRU storage to be completed and appropriate conclusions to be reached on mixed TRU storage needs and to implement the storage provisions from the results of the study.

In the interim, investigation of additional storage sites showed that existing storage Pads 18 and 19, adjacent to Pads 14-17 at the burial ground, to be identical to Pads 14-17, but not permitted. Presently Pads 18 and 19 contain non-mixed TRU waste which is to be relocated. In May of 1994, the SRS submitted a revision to the RCRA Part A Permit Application that would distribute a portion of existing interim status capacity for TRU Pads 6-17 to TRU Pads 18 and 19, Waste Storage Pads 20-22, and Pad 316-4M. The redistribution would allow the containers stored on Pads 6-17 to be aisle-spaced.

Although the study of future generation of mixed TRU waste is continuing, preliminary investigation indicates that an average annual generation rate of approximately 15,100 gallons (57.3 m³) per year can be expected. The 5-year cumulative total is 80,320 gallons (304 m³). Although this is only a preliminary estimate is subject to change, and the type of waste containers that will be used to contain this waste is not precisely known, it can still be used to roughly estimate a pad storage area requirement. Based on approximations of the average pad contents for the pads with waste containers in an aisle-spaced configuration, the 80,320 gallons (304 m³) equates to approximately 1/2 of a storage pad. Thus, permitting of pads 18 and 19 will increase available storage space to satisfy not only current needs, but future generation as well. Permitting of Pads 20-22 will afford flexibility and additional storage area as required. They also can be used for storage of MLLW.

In Section 7.1.2.2 it was noted that the excess mixed TRU waste permitted capacity was 2,204,020 gallons (8342 m³). The 80,320 gallons (304 m³) of future generation of mixed TRU waste reduces this amount of excess capacity slightly to 2,123,700 gallons (8,038 m³).

This remaining excess capacity is more than ample to offset significant changes in forecasted future mixed TRU waste generation and will provide contingency for unanticipated mixed waste storage requirements. This excess capacity also is subject to changes in storage volumes and storage area requirements that emerge from the results and conclusions of the study in progress.

7.2.3 High-Level Waste (HLW)

Fifty of the tanks in the F- and H-Area Tank Farms are Industrial Wastewater permitted, however, only 27 of them are allowed to receive fresh canyon waste on an ongoing basis. Six of the 27 tanks are dedicated for the processing of the waste for the In-Tank Precipitation and Extended Sludge Processing Facility. Of the remaining tanks, only 4133 m³ of the dedicated storage capacity remains for future waste receipts.

The future HLW projection for 1993 through 1997 is 13,570.4m³. This projection exceeds the excess storage capacity of 4133 m³ listed in Section 7.1.3.2, HLW Storage Inventory. HLW will continue to be evaporated and will eventually be processed through the In-Tank Precipitation and Extended Sludge Process Facilities once these processes are brought on-line. Based on current projections and scheduling the F- and H-Area Tank Farms will have sufficient storage capacity for future waste generation through the five year period of 1993 through 1997.

Final waste treatment and storage of the HLW will be provided by the Defense Waste Processing Facility (DWPF) and Saltstone Manufacturing Facility. With the startup of the vitrification plant, large scale waste removal activities for the F- and H-Area Tank Farms will proceed.

Section 7.3 Future Storage Capacity Needs for Offsite Waste

The storage of offsite waste prior to and subsequent to treatment will be determined at a later date.

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CHAPTER 8 DISPOSAL

Section 8.1 Introduction

This section discusses the overall process developed by DOE for evaluating issues related to the disposal of residues from the treatment of mixed low-level wastes (MLLW) subject to the Act. SRS is among the sites being analyzed further under this process for potential development as a disposal site for residues from the treatment of MLLW subject to the Act.

It is important to note that the ultimate identification of sites that may host mixed waste disposal activities will follow state and federal regulations for siting and permitting and will include public involvement in the decision-making and preparation of the appropriate environmental impact analyses in accordance with the National Environmental Policy Act. Moreover, any recommendations concerning removal of sites from further evaluation under this process do not affect environmental restoration decisions by DOE under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) concerning remediation activities.

Mixed waste subject to the Act includes high level waste (HLW) and mixed-transuranic waste (mixed TRU). However, established processes are already being implemented for studying, designing, constructing, and ultimately operating disposal facilities for these wastes (e.g., HLW repository, Waste Isolation Pilot Project). Currently, however, there are no active permitted disposal facilities operated by DOE for residues from the treatment of MLLW.

Previously, the DOE planning baseline included the development of MLLW disposal facilities at the six DOE sites currently disposing of low-level waste (Hanford Site, Savannah River Site, Oak Ridge, Idaho, Nevada, and Los Alamos). Plans for the development of these facilities are currently on hold pending the results of this process and the Environmental Management Programmatic Environmental Impact Statement (EM PEIS) currently being prepared by DOE. Once the process of acquiring permits for these sites is initiated, along with associated design and radiological performance assessment efforts, some sites may be found to not be desirable for disposal activities. Additionally, some sites which have not been before considered for disposal activities may be suitable for the disposal of some MLLW residues.

Pursuant to discussions between DOE and the States, DOE developed a process for evaluating the potential options for disposal of the residues from treatment of mixed waste subject to the Act. The sites subject to this evaluation are the 49 sites reported to Congress by DOE in the Mixed Waste Inventory Report, April 1993, as currently storing or expected to generate mixed waste.

This chapter outlines the process developed by DOE, in consultation with the States, for evaluating potential options for the disposal of residues from the treatment of MLLW. Importantly, because MLLW disposal sites are not currently being developed by DOE, preferred alternatives or final destinations for disposal of treatment residues may not be known at the time final proposed Site Treatment Plans are submitted to the States and EPA in February 1995. The results of this process are intended to be considered during the discussions about development of the Act Site Treatment Plans, both between DOE and States and among States themselves.

Section 8.2 Disposal Site Evaluation Process to Date

Although the Act does not specifically address disposal of treated mixed wastes, both DOE and the States have recognized that disposal issues are an integral part of treatment discussions. A process was established to evaluate and discuss the issues related with potential disposal of the residues from the treatment of DOE MLLW at the sites subject to the Act. The focus of this process has been to identify, from among the sites currently storing or expected to generate mixed waste, sites that are suitable for further evaluation regarding their disposal capability.

Sites determined to have marginal or no potential for disposal activities will be removed or postponed from further evaluation under this process. Remaining sites will be evaluated more extensively. Ultimately, a number of sites are expected to be technically acceptable for disposal activities.

Site Grouping

The initial step in this process was to examine each of the 49 sites to determine which sites, while individually listed in the Mixed Waste Inventory Report, were in such geographic proximity that further analysis could address them as a single site. This grouping reduced the number of sites to 44, as follows:

- The Idaho National Engineering Laboratory and Argonne National Laboratory (West) are located within several miles of each other on a single Federally-owned reservation in Idaho Falls, Idaho, and were considered a single site for further analysis;
- The Sandia National Laboratory, Livermore, and Lawrence Livermore National Laboratory are located on adjoining properties in Livermore, California, and were considered a single site for further analysis;
- The Inhalation Toxicology Research Institute and Sandia National Laboratory, Albuquerque, New Mexico, are located on the same Federally-owned reservation within several miles of each other, and were considered a single site for further analysis; and
- The Oak Ridge National Laboratory, Oak Ridge K-25 Site, and Oak Ridge Y-12 are all located within the Federally-owned Oak Ridge Reservation, in Oak Ridge, Tennessee, and were considered a single site for further analysis.

Initial Site Screening

The remaining 44 sites were screened against three exclusionary criteria. These criteria were developed by reviewing Federal and State laws regarding the siting of waste treatment, storage, and disposal facilities to determine whether any criteria existed which could be considered exclusionary minimum requirements for hosting disposal activities and which could be applied uniformly across sites. It was agreed at a joint DOE/States meeting in Tucson, Arizona on March 3-4, 1994, that in order to be further evaluated for potential disposal activities, a site:

- must not be located within a 100-year floodplain;
- must not be located within 61 meters (200 feet) of an active fault; and
- must have sufficient area to accommodate a 100-meter buffer zone.

Two of the criteria (100-year floodplain and active fault) are derived from regulatory requirements under the Resource Conservation and Recovery Act which restrict the location of waste treatment, storage, and disposal facilities. The third criteria (sufficient area for 100-meter buffer) is derived from guidance from the U.S. Environmental Protection Agency, U.S. Nuclear Regulatory Commission, and U.S. Department of Energy concerning the area required to properly operate such facilities.

Application of the three exclusionary criteria identified 18 sites which did not meet the criteria (see Figure 8-1). The results were presented at a March 30-31, 1994, joint DOE/States meeting in Dallas, Texas. At the meeting, it was agreed to remove the 18 sites from further evaluation and that DOE would collect additional site-specific information on the remaining 26 sites to identify the strengths and weaknesses of the remaining sites for the purpose of disposal activities (see Figure 8-2). It was also agreed that DOE and any affected States may

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propose additional sites for elimination from further evaluation after review of the site-specific information and further discussions.

26 Site Evaluation

DOE and the States met on July 26-27, 1994, in Denver, Colorado to discuss the site specific information on the 26 sites and to consider proposals for elimination of sites from further evaluation. The focus of these discussions was to identify sites suitable for further evaluation regarding their disposal capability. It was agreed that sites determined to have marginal or no potential for disposal activities would be removed or postponed from further evaluation under this process. As a result of the meeting, DOE and the States agreed that the following sites would be eliminated from further evaluation due to their limited potential for disposal activities:

Site	State
Energy Technology Engineering Center	California
General Atomics	California
General Electric Vallecitos Nuclear Center	California
Pinellas Plant	Florida
Site A/Plot M	Illinois

Additionally, DOE and the States agreed that due to its geographic proximity, the Knolls Atomic Power Laboratory at Niskayuna, New York, would be merged with the Knolls Atomic Power Laboratory at Kesselring, New York, for further analysis. DOE and the States also agreed that the following sites, while not eliminated from further evaluation, would be given a lower priority for further evaluation:

Site	State
Weldon Spring Remedial Action Project	Missouri
Brookhaven National Laboratory	New York
Mound Plant	Ohio
Bettis Atomic Power Laboratory	Pennsylvania

Sites assigned a lower priority for further evaluation had issues that required further consideration, including whether the technical abilities of the site were adequately known, the volume of mixed waste which may be generated by the site, and whether other arrangements for disposal of the sites' mixed waste were adequate. DOE and the States agreed to further evaluate these sites in terms of their ability to dispose of their own mixed waste on-site only if no other options for disposal of their wastes could be identified through the disposal evaluation process. In no case would these sites be considered as a disposal option for wastes from other sites, and could be eliminated from further analysis if sufficient information suggests that their potential for disposal activities is too limited.

Section 8.3 Next Steps in Disposal Site Evaluation Process

For the sites not eliminated from further evaluation or assigned a lower priority for evaluation, a more technically detailed performance evaluation will be conducted to increase the understanding of the strengths and weaknesses of a site's potential for disposal activities and to better identify what types of disposal activities could or could not occur at a site. A configuration analysis (risk, cost, transportation) will also be prepared, and a final set of sites will be identified as disposal options which will be technically capable of disposing of some waste. DOE officials, in concert with the public and pursuant to the National Environmental Policy Act, will then identify those sites that will be further evaluated for potential development as disposal sites. Permitting and preparation of performance assessments in accordance with radioactive waste management regulations will then be undertaken collaboratively with States and regulators.

Performance Evaluation

The performance evaluation to be conducted for each of the remaining sites will entail the collection of site-specific data related to the natural surroundings, geotechnical setting, groundwater and surface water characteristics, and other factors related to the disposal capabilities of each site. This information will then be used to evaluate the sites and determine what types and quantities of waste may be able to be disposed at a given site. The performance evaluations will be initiated in August, 1994, and will be completed by February, 1995. The 16 sites being carried forward for this analysis are:

Site	State
Lawrence Livermore National Laboratory, Site 300	California
Rocky Flats Plant	Colorado
Idaho National Engineering Laboratory	Idaho
Argonne National Laboratory	Illinois
Paducah Gaseous Diffusion Plant	Kentucky
Nevada Test Site	Nevada
Los Alamos National Laboratory	New Mexico
Sandia National Laboratory	New Mexico
Knolls Atomic Power Laboratory – Kesselring	New York
West Valley Demonstration Project	New York
Fernald Environmental Management Project	Ohio
Portsmouth Gaseous Diffusion Plant	Ohio
Savannah River Site	South Carolina
Oak Ridge Reservation	Tennessee
Pantex Plant	Texas
Hanford Site	Washington

Configuration Analysis

Through the Draft EM PEIS currently being prepared by DOE, the potential cost, risks, transportation, and other environmental impacts of using each of the remaining 16 sites for some level of disposal activity will be analyzed. This analysis is currently scheduled to be released for public review and comment in late 1994/early 1995.

Site Limitations Analysis

Following public comment on the Draft EM PEIS and completion of the performance evaluations on the remaining 16 sites, DOE will work with the States and public to develop estimates of the quantities and types of waste that could be disposed at the 16 sites. It is expected that the results of these two analyses may indicate that some of the remaining 16 sites are not suitable for further analysis.

Final EM PEIS

While the final proposed Site Treatment Plans are being prepared, and following their submission by DOE to the States and other regulators, it is expected that individual States and DOE will enter discussions concerning what wastes will be treated at which sites. It is also expected that as a part of these discussions, some arrangements may be established between DOE sites and States as to how any future disposal activities will be handled. DOE expects that the information supplied throughout this process will be used in those discussions. Likewise, DOE expects that the Final EM PEIS analyses will encompass the range of discussions and arrangements under consideration.

Post-Compliance Order Activities

It is expected that by October, 1995, when Compliance Orders are expected to be issued under the Act, discussions among States and DOE sites concerning disposal of the residues from the treatment of mixed waste may not be completed. It is therefore expected that a Record of Decision under the EM PEIS relative to disposal activities may be delayed somewhat to allow discussions to continue further. When a Record of Decision is issued, it will identify preferred sites to be recommended for further development as disposal facilities.

Post-Record of Decision Activities

Following the issuance of a Record of Decision under the EM PEIS on disposal activities, DOE sites will, as appropriate, initiate site-specific Environmental Impact Statements on the proposed disposal facilities, initiate performance assessment processes in accordance with radioactive waste management regulations, and collaboratively with the States and other regulators initiate processes for permitting of disposal facilities.

**Figure 8-1
Sites Eliminated in Initial Screening**

Site	Exclusionary Criteria		
	100 meter buffer	100-Year Floodplain	Active Fault
California			
Lawrence Berkeley Laboratory	•		
Laboratory for Energy-Related Health Research	•		
Mare Island Naval Shipyard (a)		•	
Colorado			
Grand Junction Project Office		•	
Connecticut			
Knolls Atomic Power Laboratory, Windsor	•		
Hawaii			
Pearl Harbor Naval Shipyard (a)		•	
Iowa			
Ames Laboratory	•		
Maine			
Portsmouth Naval Shipyard (a)		•	
Missouri			
Kansas City Plant		•	
University of Missouri	•		
New Jersey			
Middlesex Sampling Plant	•		
Princeton Plasma Physics Laboratory	•		
New York			
Colonie Interim Storage Site	•		
Ohio			
Battelle Columbus Laboratory	•		
RMI Titanium, Inc.	•		
South Carolina			
Charleston Naval Shipyard (a)		•	
Virginia			
Norfolk Naval Shipyard (a)		•	
Washington			
Puget Sound Naval Shipyard (a)		•	

- Site fails criteria
- (a) Site potentially in Coastal High-Hazard Area

Figure 8-2
26 Sites Remaining After Initial Screening

California

Energy Technology Engineering Center
General Atomics
General Electric Vallecitor Nuclear Center
Lawrence Livermore National Laboratory, Site 300

Colorado

Rocky Flats Plant

Florida

Pinellas Plant

Idaho

Idaho National Engineering Laboratory

Illinois

Argonne National Laboratory
Site A/Plot M

Kentucky

Paducah Gaseous Diffusion Plant

Missouri

Weldon Spring Remedial Action Project

Nevada

Nevada Test Site

New Mexico

Los Alamos National Laboratory
Sandia National Laboratory

New York

Brookhaven National Laboratory
Knolls Atomic Power Laboratory – Kesselring
Knolls Atomic Power Laboratory – Niskayuna
West Valley Demonstration Project

Ohio

Fernald Environmental Management Project
Mound Plant
Portsmouth Gaseous Diffusion Plant

Pennsylvania

Bettis Atomic Power Laboratory

South Carolina

Savannah River Site

Tennessee

Oak Ridge Reservation

Texas

Pantex Plant

Washington

Hanford Site

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CHAPTER 9 OFFSITE WASTE

Chapter 9 provides information on the requests from other DOE sites for the SRS to analyze selected waste streams to determine the feasibility for treatment of these streams at SRS.

In making the determination, a simple, preliminary analysis was performed. Sites wishing SRS to perform an analysis submitted characterization data in a formal request. In most cases, contact was made with the requesting sites to supplement the waste data provided to insure that SRS had appropriate information. Characterization information for each offsite waste stream was compared to the waste acceptance criteria for the specific SRS treatment facilities. If the waste stream was within the acceptance criteria for an SRS treatment facility, the waste could be accepted. If the waste stream was outside of the treatment facility acceptance criteria, the waste stream was rejected. The comparison of each waste stream to the treatment facility acceptance criteria was completed by the technical representatives for the specific treatment facility.

Information has been incorporated into the DSTP in the form of three tables. Table 9.1 provides a summary of the waste streams from offsite DOE locations determined to be suitable for treatment at SRS. Included in this table is the SRS facility proposed to treat the waste and the volume, with totals provided for each SRS treatment facility. Table 9.2 lists other sites (as of 8/1/94) that have notified SRS that the site is the preferred treatment option for certain waste streams. Table 9.3 lists all the offsite waste streams evaluated by SRS. The waste volumes (cubic meters) are reported as a 5-year forecast, although some of these numbers from other DOE sites may represent a 30-year projection.

The listing of these waste streams in Table 9.2 is not an indication that these streams are accepted for treatment at SRS. This determination will not be made until the completion of the Final Site Treatment Plan when all stakeholder input is complete. The information is an indication of the feasibility of treating selected, offsite waste and indicates a preliminary determination made by other offsite facilities.

The impacts to SRS operations resulting from treatment of these offsite wastes cannot be fully determined at this time. Site impacts depend on the volume and characterization of waste to be treated as well as prioritization of onsite and offsite waste treatment. Prioritization protocols for treatment of offsite mixed waste to ensure timely treatment of wastes Subject to RCRA LDRs and wastes not stored in compliance with RCRA regulations will be developed.

If SRS is selected to treat offsite wastes, major changes to the SRS facility baseline documents including regulatory permits will be required prior to the initiation of waste treatment operations. Since these modifications to baseline documents have not been forecasted, an accurate schedule for waste treatment operations cannot be determined at this time.

The life cycle cost for waste treatments are dependent on the treatment schedule. Therefore, accurate treatment costs cannot be established. WSRC recommends cost estimates be based on costs presented in the Draft Site Treatment Plan Cost Information Guidance dated April 21, 1994. Transportation costs for shipment of remote and contact handled waste, if needed, can be found in the Draft Site Treatment Plan Cost Information Guidance Revision 0, dated March 8, 1994.

Based on the forecasted staffing for the SRS mixed waste treatment facilities, additional staff is not anticipated for treatments of offsite mixed waste. If SRS is required to repackage or sort offsite wastes prior to treatment, then additional staff to support those operations may be required. However, until the scope of the operations to treat offsite waste is further defined, staffing impacts cannot be fully determined.

Table 9.1 – Waste Streams from Offsite DOE Locations Determined to be Feasible for Treatment at the Savannah River Site

SRS Treatment Facility	DOE Site	Number of Waste Streams	Volume (30 yr forecast in m ³)
Consolidated Incineration Facility – Liquid and Solid Feed			
	Charleston Naval Ship Yard	3	1.3
	Rocky Flats	13	955.0
	West Valley	1	.1
	Idaho National Engineering Laboratory	14	4203.6
	Naval Reactor Facilities	38	164.7
	Hanford	17	9716.4
TOTAL		86	15041.1
Consolidated Incineration Facility – Ashcrete Process			
	Idaho National Engineering Laboratory	7	11.8
	Naval Reactor Facilities	1	3.0
TOTAL		8	17.9
M-Area Vendor Treatment Process			
	Charleston Naval Ship Yard	1	0.2
	Rocky Flats	1	8.8
	West Valley	1	.1
	Idaho National Engineering Laboratory	14	114.7
	Naval Reactor Facilities	2	0.4
	Hanford	3	1607.1
TOTAL		22	1731.8
M-Area Liquid Effluent Treatment Facility			
	West Valley	1	.1
	Idaho National Engineering Laboratory	3	11.9
	Naval Reactor Facilities	1	0.62
TOTAL		5	12.4
Total Offsite Waste Streams Feasible for SRS Treatment*		108*	15,192.6*

*The total volume of waste that SRS can treat does not correspond directly to the total volumes that the individual facilities can treat. The reason for this difference is that a waste stream may be included for treatment at more than one SRS facility.

**Table 9.2 – Offsite Waste Streams for which Other DOE Locations
Have Listed SRS Facilities as the Preferred Treatment Option**

Naval Reactors

Waste Stream No.	DOE Site/ Waste Stream	SRS Treatment Facility	Potential Issues	30 Yr. Forecast Vol. (m ³)
NN-W002	Solid Waste Contaminated With Chromium	CIF – Solid Feed		3.0
CN-W001	Solids Containing Potassium Chromate	CIF – Solid Feed		0.8
CN-W004	Organic Debris with Lead and/or Chromium	CIF – Solid Feed		0.24
BT-W001	Oil Containing Heavy Metals #1	CIF – Solid Feed		10.91
BT-W002	Spent M-192 Solvent Rags	CIF – Solid Feed		0.21
BT-W003	Oil Containing Heavy Metals #2	CIF – Liquid Feed		0.75
BT-W007	Solids with Solvents	CIF – Solid Feed		7.14
BT-W017	Ion Exchange Resin	CIF – Solid Feed	Treatment of this waste may be impacted by the new EPA Policy that prohibits incineration of inorganic waste containing hazardous metals. If surface radiation rate exceeds 10 mR/hr. the waste cannot be treated at CIF.	0.001
KK-W001	Filters Contaminated with Lead and Silver	CIF – Solid Feed M-Area –VTF	Treatment of this waste may be impacted by the new EPA Policy that prohibits incineration of inorganic waste containing hazardous metals.	0.2
KK-W008	Organic Sludges/Particulate	CIF – Solid Feed	If this waste contains D009B or D009c waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	25.2
KK-W009	Organic Debris without Metals	CIF – Solid Feed	TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	2.4
KA-W003	Trichloroethylene	CIF – Solid Feed		0.3
KA-W006	Freon 113 on Rags	CIF – Solid Feed		0.4
KA-W013	Organic Debris with Heavy Metals	CIF – Solid Feed	TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	2.4

Waste Stream No.	DOE Site/ Waste Stream	SRS Treatment Facility	Potential Issues	30 Yr. Forecast Vol. (m ³)
KA-W014	Organic Sludges/Particulate with Heavy Metals	CIF – Solid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	2.4
KW-W006	Organic Sludges/Particulate with Heavy Metals	CIF – Solid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	4.8
BT-W018	TCLP Extract Fluid	CIF – Liquid Feed		0.006
KK-W003	Oils	CIF – Liquid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	6.0
KK-W005	Organic Debris with Heavy Metals	CIF – Solid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes. If waste contains D008c the lead solids must be removed prior to treatment at the CIF to meet the LDR Treatment Standards for D008C wastes.	22.82
KK-W007	Inorganic Sludges/Particulate	CIF – Solid Feed	Treatment of this waste may be impacted by the new EPA Policy that prohibits incineration of inorganic waste containing hazardous metals. If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	3.0
KK-W011	Cutting Oils and Liquids	CIF – Liquid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	2.4
KA-W002	Cutting Oils, Liquids, Lubricants	CIF – Liquid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	0.6

Waste Stream No.	DOE Site/ Waste Stream	SRS Treatment Facility	Potential Issues	30 Yr. Forecast Vol. (m ³)
KA-W007	Oils Containing Heavy Metals and Solvents	CIF – Liquid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	12.1
KA-W009	Organic Debris with Heavy Metals	CIF – Solid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	12.6
KA-W012	Inorganic Sludge/particulate with Heavy Metals	CIF – Solid Feed	Treatment of this waste may be impacted by the new EPA Policy that prohibits incineration of inorganic waste containing hazardous metals. If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	2.4
KW-W001	Oil with Heavy Metals	CIF – Liquid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	1.075
KW-W003	Organic Debris with Heavy Metals	CIF – Solid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	6.0
KW-W004	Inorganic Debris and Equipment	CIF – Solid Feed	Treatment of this waste may be impacted by the new EPA Policy that prohibits incineration of inorganic waste containing hazardous metals. If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	13.3
KW-W005	Inorganic Sludges/Particulate with Heavy Metals	CIF – Solid Feed	Treatment of this waste may be impacted by the new EPA Policy that prohibits incineration of inorganic waste containing hazardous metals. If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	0.6
CN-W007	Flammable Organic Debris	CIF – Solid Feed		

Table 9.3 – SRS Initial Assessment of Offsite Waste Streams for Treatment at SRS

Charleston Naval Shipyard

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
CN-W002	Elemental Lead	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	2.29
CN-W004	Lead-contaminated Organic Debris	CIF – Solid Feed		0.16
CN-W001	Chromate-contaminated Organic Debris	CIF – Solid Feed M-Area – VTF		0.80
CN-W003	Lead/Chromium-based Paint Chips	CIF – Solid Feed		0.30

Rocky Flats

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
RF-W016	Acids	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	9.5
RF-W077	Acidic Oils	None	Waste exceeds WAC limits for CIF. Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	1.68
RF-W047	Analytical Lab Sources	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	3.73
RF-W020	Beryllium Fines	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	2.17
RF-W003	Contaminated Composite Chips	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	90.6
RF-W006	Combustibles	CIF – Solid Feed		682.6
RF-W014	Cutoff Sludge	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	7.95
RF-W054	Cyanides	CIF – Liquid Feed		0.84
RF-W021	Electrochemical Milling Sludge	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.84
RF-W051	Excess Chemicals	CIF – Liquid Feed CIF – Solid Feed		33.3
RF-W074/ 075	Filters (Cemented)	CIF – Solid Feed		17.8 6.7
RF-W015	Fluidized Bed Incinerator Oil	CIF – Liquid Feed		89.8
RF-W043	Glass	None	Incompatible waste matrix. Inappropriate treatment for LDR.	8.86

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
RF-W035	Glovebox Parts with Lead	None	Incompatible waste matrix. Incompatible waste matrix.	17.31
RF-W024	Ground Glass	None	Incompatible waste matrix. Inappropriate treatment for LDR.	13.79
RF-W042	Heavy Metal (non-SS)	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	1.26
RF-W022	Incinerator Ash	M-Area VTF		8.82
RF-W045	Insulation	None	Incompatible waste matrix. Inappropriate treatment for LDR.	4.64
RF-W023	Lead	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	40.87
RF-W030	Leaded Gloves	None	Incompatible waste matrix. Policy restriction.	5.53
RF-W031	Leaded Gloves/Acid Contaminated	None	Incompatible waste matrix. Policy restriction.	.21
RF-W005	Metal	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	68.10
RF-W049	Miscellaneous Liquids	CIF – Liquid Feed		6.0
RF-W061	Miscellaneous Pu Recovery By-Products	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.21
RF-W046	Organics – Discard Level	CIF – Liquid Feed		52.1
RF-W027	Paints	CIF – Liquid Feed		0.4
RF-W071	Particulate Sludge	CIF – Solid Feed		54.0
RF-W017	Polychlorinated Biphenyl (PCB) Liquids	CIF – Liquid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated waste.	1.3
RF-W002	Polychlorinated Biphenyl (PCB) Solids	CIF – Solid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated waste.	9.5
RF-W018	Pondcrete	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	6164.35
RF-W007	Roaster Oxide	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	82.74
RF-W019	Saltcrete	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	5025.86
RF-W048	Sand from Button Breakout	None	Incompatible waste matrix. Policy restriction.	0.21
RF-W053	Silver Nitrate	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.84
RF-W050	Soil and Cleanup Debris	None	Incompatible physical matrix.	423.4

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
RF-W064	Solar Pond Water	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	45925
RF-W009	Solidified Bypass Sludge		Incompatible waste matrix. Inappropriate treatment for LDR.	547.01
RF-W062	Solidified Organics	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	1.96
RF-W044	Solidified Process Solids	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	4.75
RF-W055	Turnings	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	11.97
RF-W025	Used Absorbent (Oil Dry)	CIF – Solid Feed		0.21
RF-W073	Organic Resin	CIF – Solid Feed		0.4

Oak Ridge National Laboratory

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
	Combustible Debris	Unknown	Insufficient waste characterization information available.	
	Organic Process Residues	Unknown	Insufficient waste characterization information available.	
	Metallic Solvent Solids	Unknown	Insufficient waste characterization information available.	
	U Contaminated Residues and Combustibles	Unknown	Insufficient waste characterization information available.	
	Ignitable Solids	Unknown	Insufficient waste characterization information available.	
	Plating Process Treatment Solids	Unknown	Insufficient waste characterization information available.	
	Solvent and Plating Solution Treatment Solids	Unknown	Insufficient waste characterization information available.	
	Ignitable Organic Solids	Unknown	Insufficient waste characterization information available.	
	Ignitable Metallic Organic Solids	Unknown	Insufficient waste characterization information available.	
	Ignitable Corrosive Solids	Unknown	Insufficient waste characterization information available.	
	Plating Process Solids	Unknown	Insufficient waste characterization information available.	
	Ignitable Solvent Sludges	Unknown	Insufficient waste characterization information available.	
	Oily Rags and Solids	Unknown	Insufficient waste characterization information available.	
	K-1232 Spent Carbon Filter Agent	Unknown	Insufficient waste characterization information available.	

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
	Laboratory Trash	Unknown	Insufficient waste characterization information available.	
	Centrifuge Epoxies/Resins	Unknown	Insufficient waste characterization information available.	
	Oxidizing Solids (bulk)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1126)	Unknown	Insufficient waste characterization information available.	
	RQ, Hazardous Waste Solid (MWIR 1127)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1129)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1130)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1131)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1128)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1136)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1133)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1134)	Unknown	Insufficient waste characterization information available.	
	RQ, Hazardous Waste Solid (MWIR 1135)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solid (MWIR 1132)	Unknown	Insufficient waste characterization information available.	

West Valley

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
WV-W013	Pu Aqueous Waste	None	Facilities not designed to treat TRU wastes.	0.734
WV-W029	Immersion Bucket Solution	M-Area – LETF		0.139
WV-W030	Aqueous Laboratory Waste	None	Inappropriate treatment for LDR.	0.005
WV-W034	Acidic Metal Aqueous Wastes	M-Area – VTF		0.0006
WV-W002	Low Level Radioactive Lead	None	Incompatible waste matrix. Inappropriate treatment for LDR.	1.39
WV-W007	Pyridine/Cyanide Waste	CIF – Solid Feed		0.02
WV-W020	Mercury Waste	None	Incompatible waste matrix. Inappropriate treatment for LDR.	1.965
WV-W024	TRU Lead Waste	None	Facilities not designed to treat TRU wastes.	2.19
WV-W038	Fluorescent Light Bulbs	None	Incompatible waste matrix. Inappropriate treatment for LDR.	0.0334

Idaho National Engineering Laboratory

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
AW-W001	Cadmium Metal Ingots	M-Area – VTF		0.46
AW-W002	Shielding Material and Lead-lined Gloves	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.97
AW-W006	Sodium Contaminated Paper and Cloth	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	2.85
AW-W007	Sodium Reactor Coolant	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	5.2
AW-W008	Sodium Potassium Alloy	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.19
AW-W013	Contaminated Hg-IBC Cask Matrix	None	Waste exceeds WAC limits. Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.10
AW-W018	Sodium Reactor Coolant	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.145
AW-W019	Sodium Potassium Alloy	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.01
AW-W023	Cadmium Contaminated Cleanup Waste	CIF – Solid Feed M-Area – VTF		0.03
IN-W002	EDTA and Lead	CIF – Liquid Feed M-Area – VTF		0.15
IN-W003	Solid Lead Bricks	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.06
IN-W009	Radioactive Calibration Sources	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.004
IN-W014	Cadmium Sheetting	M-Area – VTF		0.32
IN-W018	Heavy Metal Liquid Laboratory Waste	CIF – Ashcrete M-Area – VTF		0.91
IN-W019	Solid and Semisolid Concrete	M-Area – VTF		5.76
IN-W021	TRA Scintillation Cocktails	CIF – Liquid Feed		0.32
IN-W027	Lead Contaminated Debris	CIF – Solid Feed		13.2
IN-W028	Lead Bricks, Sheets Blankets and Scrap	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	399.82
IN-W032	WERF Ash (Failed EP TOX or TCLP)	M-Area – VTF		3.25
IN-W033	Heterogeneous Inorganic Debris	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	2.29

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
IN-W038	TAN Decon Solvent Waste	CIF – Liquid Feed M-Area – LETF		5.9
IN-W041	IET Liquid Waste	CIF – Ashcrete M-Area – LETF		0.4
IN-W042	S1G Decon Sodium	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.25
IN-W045	EBRI Decon Sodium and liquid metal	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.681
IN-W048	WEDF Solidification Tests	CIF – Ashcrete M-Area – VTF		0.08
IN-W049	HTRE II ¹ , PPE Waste	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.6
IN-W056	Electroplating Solution	CIF – Ashcrete M-Area – VTF		0.11
IN-W058	Cadmium Contaminated Fuel Grids	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	37.8
IN-W060	Mercury contaminated Soil	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	6.88
IN-W064	Radioactive PCB Oil with TCLP Organics	CIF – Liquid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated wastes.	0.42
IN-W065	Radioactive PCB Oil with Heavy Metals	CIF – Liquid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated waste.	0.21
IN-W070	WERF Incinerator Refractory Brick	M-Area – VTF		3.0
IN-W071	Radioactive Lead	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	5.4
IN-W077	Melter Test Waste	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.03
IN-W084	Lead Shielding	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.5
IN-W085	Lead Bricks	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	17.20
IN-W086	Lead Bricks	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	4.3
IN-W108	Metal Waste Contaminated with Lead	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.2
IN-W109	Cadmium Contaminated Solids	CIF – Solid Feed		42.6

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
IN-W111	Lead Bricks, Sheets, and Tiles	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	810.4
IN-W118	SS Fuel Racks with Cadmium	M-Area – VTF		41.23
IN-W119	Liquid Acid/Mercury Mixed Wastes	CIF – Ashcrete		4.33
IN-W120	Liquid High Chloride Corrosive Mixed Waste	CIF – Ashcrete M-Area – LETF		5.55
IN-W122	Contaminated Debris	CIF – Solid Feed		4071
IN-W123	LLW APS HEPA Filters	CIF – Solid Feed M-Area – VTF		53.2
IN-W124	D006-D011 Contaminated Solids	CIF – Solid Feed		10.23
IN-W126	LET and D HEPA Filters	CIF – Solid Feed M-Area – VTF		5.74
IN-W153	Lead Bricks, Sheets and Scrap	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	35.4
IN-W155	Drill Cutting Contaminated With Lead	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.03
IN-W156	Lead Contaminated Debris	CIF – Solid Feed		0.21
IN-W377	Treatability Study Residues	CIF – Ashcrete M-Area –VTF		0.49
IN-W379	Laboratory Equipment and Debris	CIF – Solid Feed		0.42

Naval Reactors

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
NN-W002	Solid Waste Contaminated With Chromium	CIF – Solid Feed		3.0
CN-W001	Solids Containing Potassium Chromate	CIF – Solid Feed		0.8
CN-W002	Lead and Lead Bearing Materials	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	2.54
CN-W004	Organic Debris with Lead and/or Chromium	CIF – Solid Feed		0.24
BT-W001	Oil Containing Heavy Metals #1	CIF – Solid Feed		10.91
BT-W002	Spent M-192 Solvent Rags	CIF – Solid Feed		0.21
BT-W003	Oil Containing Heavy Metals #2	CIF – Solid Feed		0.75
BT-W007	Solids with Solvents	CIF – Solid Feed		7.14

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
BT-W008	Mercury Containing Waste	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.21
BT-W010	Waste Oil with Heavy Metals and PCBs	CIF – Liquid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated waste.	0.21
BT-W011	Sludge Containing Solvents	CIF – Solid Feed		0.026
BT-W016	Scintillation Standards	CIF – Liquid Feed		0.012
BT-W017	Ion Exchange Resin	CIF – Solid Feed		0.001
BT-W019	Lead	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	5.92
KK-W001	Filters Contaminated with Lead and Silver	CIF – Solid Feed M-Area – VTF		0.2
KK-W008	Organic Sludges/Particulate	CIF – Solid Feed		25.2
KK-W009	Organic Debris without Metals	CIF – Solid Feed		2.4
KA-W003	Trichloroethylene	CIF – Solid Feed		0.3
KA-W005	Asbestos Contaminated with Mercury	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.2
KA-W006	Freon 113 on Rags	CIF – Solid Feed		0.4
KA-W010	Mercury Debris Containing Heavy Metals	CIF – Ashcrete		3.0
KA-W013	Organic Debris with Heavy Metals	CIF – Solid Feed		2.4
KA-W014	Organic Sludges/Particulate with Heavy Metals	CIF – Solid Feed		2.4
KW-W006	Organic Sludges/Particulate with Heavy Metals	CIF – Solid Feed		4.8
PH-W004	Solidified Waste with Chromate	CIF – Solid Feed		0.28
KK-W010	Lead Bricks, Sheets or Wool	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	6.0
KA-W011	Lead Bricks, Sheets or Wool	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	6.1
KW-W007	Lead Bricks, Sheets or Wool	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	10.0
PN-W001	Lead Contaminated Debris	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.2
PN-W003	Solidified Resin with Chromium	M-Area – VTF		0.21

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
PS-W003	Felt with Chromium and PCBs	CIF – Solid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated waste.	6.1
PS-W007	Debris with Heavy Metal and PCBs	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	10.0
PS-W011	Debris with TCLP Metals/F-Listed Solvents	CIF - Solid Feed		0.22
PS-W012	Chromium and Lead Based Paint Chips with PCBs	CIF – Solid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated waste.	2.0
BT-W009	VOC Contaminated Soil	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.42
BT-W012	VOC and PCB Contaminated Debris	CIF – Solid Feed		8.52
BT-W013	VOC and PCB Contaminated Soil	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	1.97
BT-W014	Zirconyl Nitrate	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.013
BT-W018	TCLP Extract Fluid	CIF – Liquid Feed		0.006
KK-W002	Cadmium Plated Solids	M-Area – LETF		0.62
KK-W003	Oils	CIF – Liquid Feed		6.0
KK-W005	Organic Debris with Heavy Metals	CIF – Solid Feed		22.82
KK-W006	Inorganic Debris and Equipment	CIF – Solid Feed		3.3
KK-W007	Inorganic Sludges/Particulate	CIF – Solid Feed		3.0
KK-W011	Cutting Oils and Liquids	CIF – Liquid Feed		2.4
KK-W012	Miscellaneous Laboratory Chemicals	Unknown	Insufficient waste characterization information available.	6.0
KK-W013	Soils	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	121.8
KK-W015	Soils	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	NDB
KA-W001	Miscellaneous Laboratory Chemicals	Unknown	Insufficient waste characterization information available.	12.0
KA-W002	Cutting Oils, Liquids, Lubricants	CIF – Liquid Feed		0.6
KA-W004	Mercury Metals	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.31
KA-W007	Oils Containing Heavy Metals and Solvents	CIF – Liquid Feed		12.1

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
KA-W008	Miscellaneous Laboratory Chemicals	Unknown	Insufficient waste characterization information available.	4.2
KA-W009	Organic Debris with Heavy Metals	CIF – Solid Feed		12.6
KA-W012	Inorganic Sludge/particulate with Heavy Metals	CIF – Solid Feed		2.4
KW-W001	Oil with Heavy Metals	CIF – Liquid Feed		1.075
KW-W002	Miscellaneous Laboratory Chemicals	Unknown	Insufficient waste characterization information available.	0.2
KW-W003	Organic Debris with Heavy Metals	CIF – Solid Feed		6.0
KW-W004	Inorganic Debris and Equipment	CIF – Solid Feed		13.3
KW-W005	Inorganic Sludges/Particulate with Heavy Metals	CIF – Solid Feed		0.6
KW-W008	Miscellaneous Laboratory Chemicals	Unknown	Insufficient waste characterization information available.	0.6
KW-W009	Soils	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	16.8

Hanford

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
RL-W017	Ignitable Liquids	CIF – Solid Feed		44.44
RL-W020	TC Metal Sludge/Dry Particulate (Hg)	CIF – Solid Feed M-Area – VTF		1607.14
RL-W021	TC Metal Sludges/Dry Particulate (Ca, Hg)	CIF – Solid Feed		21.42
RL-W022	Non-TC Metal/Solvent Sludges/Dry Particulate	M-Area – VTF		
RL-W034	Lead Acid Batteries	None	Incompatible physical matrix and inappropriate treatment does not meet LDR.	
RL-W035	Radioactive Lead Soils	None	Incompatible physical matrix and inappropriate treatment does not meet LDR.	
RL-W037	Radioactive Elemental Mercury (Ca)	None	Incompatible physical matrix and inappropriate treatment does not meet LDR.	
RL-W038	Mercury Sludges/Dry Particulate (Hg>260 mg/Hg)	None	Incompatible physical matrix and inappropriate treatment does not meet LDR.	
RL-W039	Organic RMW PCB Liquids 50-500 ppm (Ca)	CIF – Solid Feed CIF – Liquid Feed		

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
RL-W040	Organic RMW PCB Liquids >500 ppm (Ca)	CIF – Solid Feed CIF – Liquid Feed		
RL-W044	Appendix IV Labpacks (Ca, Hg)	CIF – Solid Feed CIF – Liquid Feed		69.28
RL-W046	Appendix IV Labpacks	CIF – Solid Feed CIF – Liquid Feed		705.89
RL-W051	Solvent/TC Metal Soils (Hg)	None	Incompatible physical matrix and inappropriate treatment does not meet LDR.	
RL-W052	Solvent Sludges/Dry Particulate	CIF – Solid Feed		166.11
RL-W053	Solvent/TC Metal Sludges/Dry Particulate (Ca)	CIF – Solid Feed		3.06
RL-W054	Solvent/TC Metal Sludges/Dry Particulate (Ca)	CIF – Solid Feed		
RL-W061	Solvent/TC Metal Organic Solid Debris (Ca, Q)	CIF – Solid Feed		107.15
RL-W062	Solvent Radioactive Lead	CIF – Solid Feed		4.46
RL-W063	Solvent Appendix IV Labpacks	CIF – Solid Feed CIF – Liquid Feed		336.72
RL-W064	Solvent Appendix IV Labpacks (Ca)	CIF – Solid Feed CIF – Liquid Feed		3671.23
RL-W065	Solvent Appendix V Labpacks	CIF – Solid Feed CIF – Liquid Feed		2117.32
RL-W066	Solvent Appendix V Labpacks (Ca)	CIF – Solid Feed CIF – Liquid Feed		840.79
RL-W067	Solvent Appendix V Labpacks (Ca, Q)	CIF – Solid Feed CIF – Liquid Feed		21.42
RL-W091	Cadmium Batteries	M-Area – VTF		

SAVANNAH RIVER SITE

MIXED WASTE

**DRAFT SITE
TREATMENT PLAN
(DSTP)**

Appendix A

AUGUST 30, 1994

INTRODUCTION

The Department of Energy (DOE) is required by Section 3021(b) of the Resource Conservation and Recovery Act (RCRA), as amended by the Federal Facility Compliance Act (FFCAct), to prepare a plan describing the development of treatment capacities and technologies for treating mixed waste (hazardous/radioactive waste).

DOE decided to prepare its site treatment plan in a three phased approach.

The first phase, called the Conceptual Site Treatment Plan (CSTP), was issued in October 1993. At the Savannah River Site (SRS) the CSTP described mixed waste streams generated at SRS and listed treatment scenarios for each waste stream utilizing an onsite, offsite DOE, and offsite or onsite commercial or vendor treatment option.

The CSTP is followed by the Draft Site Treatment Plan (DSTP), due to be issued in August 1994. The DSTP, the current activity, will narrow the options discussed in the CSTP to a preferred treatment option, if possible, and will include waste streams proposed to be shipped to SRS from other DOE facilities as well as waste streams SRS may send offsite for treatment.

The SRS DSTP process has been designed to address treatment options for each of the site's mixed waste streams.

The SRS Final Site Treatment Plan (FSTP) is due to be issued in February 1995. The compliance order would be derived from the FSTP.

The regulators are required by the FFCAct to then approve, approve with modifications, or disapprove each plan within six months and to issue an order requiring compliance with the approved plan.

This document, Appendix A, which is a part of the "Savannah River Site DSTP," supports the second phase of the site's plan.

The purpose of Appendix A is to provide the engineering analysis documentation used to develop the waste stream treatment options and selection of *Preferred Options* (PO). The POs are a SRS determination/recommendation and are subject to change based upon state and public comment.

Appendix A contains five main sections that make it easy for the reader to understand the process used as well as locate the information being sought.

Section 1.0 describes the methodology and assumptions used to determine POs.

Section 2.0 describes the different treatment facilities and treatment technologies.

Section 3.0 contains the SRS waste stream options analysis. This section is organized numerically by waste stream.

Section 4.0 contains the evaluation for offsite waste streams being treated at SRS.

Section 5.0 contains summary information.

Section 6.0 contains a list of abbreviations and acronyms.

Section 7.0 contains references used in the development of this document.

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1.0 OPTIONS EVALUATION PROCESS

This section contains three subsections. Subsection 1.1 presents an overview of the three step process used to identify POs. Subsection 1.2 presents detailed descriptions of each process step. Subsection 1.3 presents assumptions used in determining POs.

1.1 Process Methodology Overview

This section describes step by step in general terms the evaluation process used to determine POs.

Step 1 Identify Feasible Options

Purpose

To identify existing treatment facilities, existing production facilities with waste treatment capabilities and planned treatment facilities that are technically feasible options for treating the SRS waste streams.

It is assumed that facility modifications, permit modifications, etc., would be achievable.

Performed by

Technical personnel from each treatment and processing facility along with the engineers and scientists assigned to the technical group, who developed the DSTP.

Step 2 Perform Initial Screening

Purpose

To reduce the number of feasible options by assessing the option's probability of technology success.

The technology success assessment addresses the maturity and complexity of a feasible option to determine "viable" treatment options.

By assigning a Technology Success Factor (TSF) score to each feasible option, the feasible options are ranked. Those feasible options that received a high score become viable options requiring further analysis. Those feasible options that received a low score were rejected.

Performed by

Technical personnel from each treatment and processing facility along with the engineers and scientists assigned to the technical group, who developed the DSTP.

Step 3 Perform In-depth Options Analysis

Purpose

To identify a PO for each waste stream.

Performed by

Technical personnel from each treatment and processing facility along with the engineers and scientists assigned to the technical group, who developed the DSTP.

1.2 Process Methodology Detailed Explanation

The SRS Mixed Waste Inventory Report (MWIR), also a requirement of the FFCAct, currently lists SRS mixed waste streams that require treatment under RCRA. Of the SRS streams:

- Twenty-five streams have existing treatment capacity within the SRS waste management program. Included within the 25 are:
 - one stream that meets disposal standards without further treatment
 - one stream that meets disposal standards without further treatment, but that will require size reduction to facilitate disposal and will be macroencapsulated following size reduction in order to again meet treatment standards
 - one stream that will be treated under a variance granted by EPA
 - three high-level waste streams
- Three low level, mixed waste streams that have been consolidated with other streams, thus obviated separate treatment.
- Four mixed low-level waste streams that have been deleted from further consideration because a previously forecasted waste will not be generated, or the material has been tested and is not considered mixed waste, or the waste has already been accounted for.
- Three wastes containing transuranic waste (TRU) and two waste streams being managed as TRU, for which treatment options cannot be determined until the Waste Isolation Pilot Plant (WIPP) promulgates final waste acceptance criteria (WAC). This document will not, therefore, address treatment of these waste streams, but will, instead, present a TRU Waste Management Plan which describes the development of the program to provide ultimate disposal of TRU waste.
- Twenty-two low level, mixed waste streams that require in-depth options analysis (IDOA) to determine the preferred treatment option. The in-depth analysis considered five types of treatment:
 - Existing onsite treatment facilities (e.g., F- and H-Area Effluent Treatment Facility) and facilities under construction (e.g., Consolidated Incineration Facility)
 - Existing production facilities with some potential capability to treat waste, or available floor space that could be refurbished to accommodate installation of treatment processes under the "Containment Building" provision of 40 CFR 265.
 - Planned treatment facilities (e.g., Hazardous Waste/Mixed Waste Treatment Building)
 - Vendor processes operated either onsite, or at the vendor's facility
 - Waste treatment processing available from other DOE sites
- New waste streams that are identified during the development of the DSTP and FSTP will have in-depth options analysis completed for issuance in the FSTP.

Initial Screening

Technology Risk Assessment & Technology Success Factor

Westinghouse Savannah River Company (WSRC) uses a methodology for assessing technology risk of a process or facility based upon *Risk Management Concepts and Guidance* written by the Analytical Sciences Corporation for the Defense Systems Management College. The methodology was originally developed by the Department of Defense (DOD) to assist with evaluation of new weapons systems.

The "risk" assessed in a technology risk assessment is the possibility that a process under consideration may be too new and too complex to perform as expected. This type of assessment is biased in favor of simple and well established technology. According to the WSRC *Conduct of Engineering Manual E7* Procedure 2.16, some questions to help determine technology risk indicators include:

- Are state-of-the-art advances in technology being used in the design?
- Is the equipment exposed to a harsh or unique environment?
- Does the design require complex integration of control systems, or computer software?
- Is the design based on research and development, or does it use mathematical models for prediction?
- Is the cost of recovery from system failure high?
- Is the design evolving as construction is going on?
- Is the design new, or an extension of successful existing designs?
- Are familiar components being used in new, non-standard ways?
- Does the facility or process stand alone, or must it interface with other facilities or processes?

Technology risk does not look directly at whether the system is safe. Special analyses done in the design phase of a project ensure that new processes pose no hazard to workers, the public, or the environment.

No process or facility can be simpler than its most complex part or more mature than its newest part. Thus, a technology risk assessment begins with an examination of the whole process or facility to identify the crucial part that has the most complex and the least mature technology. While the interaction of numerous parts and features may result in an overall process that is even more complex and untried than each individual piece, the identification of this key part is the first step in assessing the probability of a technology's failing.

The probability of failure (Pf) is assigned a "magnitude" based on guidance in Table 1. When engineering assessment indicates the factors fall between the extremes noted, intermediate magnitudes can be assigned.

Table 1 – Probability of Failure

Magnitude	Maturity Factor (Pm)	Complexity Factor (Pc)
0.1	<ul style="list-style-type: none"> Components exist Performance requirements are specific Design is not based on numerous, wide-ranging assumptions 	<ul style="list-style-type: none"> Design is simple Design is complete before installation begins New process or facility has few interfaces with other facilities, or processes
0.5	<ul style="list-style-type: none"> Components are used in non-standard ways Requirements are changing Design is based on major assumptions that have a significant impact on the design output 	<ul style="list-style-type: none"> Design has many interconnected facets Construction has begun on some parts of the process or facility without the whole design being finalized Process or facility must interface with other process or facilities to achieve overall objectives
0.9	<ul style="list-style-type: none"> Design is state-of-the-art Research is still on-going Functional processes have not been built Requirements are undefined Design is based largely on assumption instead of fact 	<ul style="list-style-type: none"> Design is very complex Design and construction are proceeding almost at the same time Process or facility depends on new and extensive software Process or facility is a vital part of an interdependent group of other facilities

Next, a magnitude is assigned to the consequence of failure (Cf). Such consequences range from minor inconveniences from which recovery is quick and inexpensive, to technical catastrophes from which recovery, if possible at all, is prolonged and costly. Table 2 provides guidance for assigning the consequence of failure magnitude.

Table 2 – Consequences of Failure

Magnitude	Consequence of Failure (Cf)
0.1 (low)	Minimal, or no, consequences, unimportant
0.3 (minor)	Small reduction in technical performance
0.5 (moderate)	Some reduction in technical performance
0.7 (significant)	Degradation in technical performance
0.9 (high)	Technical goal cannot be achieved

For all assessments of the technology risk of the waste treatment options a Cf was chosen equal to 0.7. Should a preferred treatment option suffer a technical failure, it was postulated that the result would be a costly and time-consuming redesign to develop another process that could meet requirements. Until the redesign was complete and implemented, waste treatment performance would be significantly degraded.

The maturity and complexity factors are combined with the consequence factor in an equation to give the risk factor (RF):

First the maturity and complexity factors are averaged:
 $(Pm + Pc)/2 = Pf$

Then, the risk factor (RF) can be calculated:
 $RF = (Pf + Cf) - (Pf \times Cf)$

The resulting risk factor (RF) is a number between 0.19 and 0.99.
 If $Pf = 0.1$ and $Cf = 0.1$, then $RF = (0.1 + 0.1) - (0.1 \times 0.1) = 0.19$
 If $Pf = 0.9$ and $Cf = 0.9$, then $RF = (0.9 + 0.9) - (0.9 \times 0.9) = 0.99$

As can be seen from the above, the closer the RF is to 0.99 the greater the technology risk.

In the model used to screen and evaluate waste treatment options, numbers ranging from 0 to 100 were assigned to treatment option attributes, with high numbers representing more desirable features. To make technology risk assessment scores work the same way (high numbers indicating a low technology risk), the risk factor (RF) was converted arithmetically to a number between 0 and 100, called the Technology Success Factor (TSF). The nearness with which a TSF score approaches 100 indicates the degree of simplicity and maturity of a treatment option.

In the initial screening of treatment options, those with low (less than 50) TSF scores were discarded. This does not mean that promising, but immature, technologies will not be considered for treatment of SRS waste. It means only that at this time such technologies remain unproved and cannot be recommended in the Site Treatment Plan. Other departments at SRS are investigating and encouraging such innovative waste treatment technologies. When these technologies mature, the SRS waste management approach will allow incorporating them into the Site's waste treatment program.

In-Depth Options Analysis (IDOA)

After the elimination of those treatment options with a low possibility for technological success, most waste streams still had several viable treatment options. It became necessary to choose the "best" treatment for each waste stream. To determine the best option, all viable treatment options were subjected to an "In-Depth Options Analysis" (IDOA). Comparison among treatment options for a given waste stream is facilitated when each option can be assigned a number that reflects the degree to which the option satisfies a set of criteria or requirements. Such a number aids with the engineering assessment by which one option is chosen over others. The method of developing a numerical ranking of treatment options is known as the IDOA model.

The IDOA process took several steps:

1. Attributes by which all treatment processes would be analyzed were determined
2. The relative importance of the attributes was determine.
3. Each viable option received a numerical score for each attribute
4. The IDOA model was applied to the treatment option
5. Engineering assessment took the IDOA model results into account with other factors to determine the Preferred Option to treat a given waste stream.

Categories and attributes analyzed were:

Process Parameters

- Volume alteration
- Secondary waste generation
- Destruction, removal, and demobilization efficiency
- Flexibility
- Ability to be shipped
- Final waste form

Engineering Parameters

- System implementability
- Availability
- Scalability
- Remedial measures
- Schedule for treatment of waste

Personnel Parameters

- Consequences of unmitigated accident scenarios
- Non-operational worker potential exposure
- Operational worker potential exposure
- Transportation potential exposure

Regulatory Parameters

- Need for a variance
- Ability to obtain a permit
- Waste disposal

Public Acceptance

- Public acceptance

Cost Considerations

- Life cycle cost
- Funding availability

Industry Involvement

- Market for technology
- Private sector involvement

"Enabling statements," were provided for clarifying the above attributes, to assist with the process experts' evaluation of treatment options. The "enabling statements" appear in Table 3. The attributes, and enabling statements formed the basis with which "viable" treatment processes were assessed and compared.

To evaluate a viable treatment option, a team of waste treatment process experts applied the enabling statements to each option. They assigned a number from 0 (low) to 100 (high) to each attribute. The score reflected the experts' assessment of how well the process satisfied the requirement posed by the attribute.

For example, consider the attribute of "Secondary Waste Generation." If the process produced a small quantity, all of which could be handled by existing technologies, the process experts would give the process a "high" numerical rating (median 80). If the process produced as much as 10% additional waste that existing technologies could handle, the process experts rated it "medium" (median 50). If the process produced large amounts of secondary waste, or if existing technologies could not handle the secondary waste, the experts rated it "low" (median 20). If the experts felt a score other than the median better reflected conditions, they could assign another number, provided they gave an explanation for the variation (e.g., in the preceding case, if the process produced 20% additional secondary waste, the evaluation would include a statement such as "subtract 10 points because of additional waste generation").

For the "cost attribute" a team of cost estimators instead of process experts determined the life cycle cost. The estimators developed:

- **Pre-operating cost** to design and prepare initial documentation for the facility
- **Facility cost** to build and equip a new treatment facility, or modify an existing one
- **Operating and maintenance cost** for the life of the facility
- **Disposal cost** of all final waste forms in compliance with the Land Disposal Restrictions
- **Decontamination and decommissioning cost** to return the facility to a safe and environmentally benign condition at the end of its useful life.

The process experts' evaluation resulted in a raw *technical* score for each attribute, and inclusion of the cost estimators' life cycle cost data resulted in a raw *total* score. Nevertheless, these raw scores did not reflect the relative importance of the attributes. The Technical

Advisory Committee (TAC), a group of experienced technical experts with backgrounds in engineering design, environmental protection, process technology, safety, and health, appointed to oversee the treatment selection process, recognized that not applying a weighting factor to each attribute assigned the same weight to all of them. So, the Technical Advisory Committee assessed the attributes extensively to propose a weight for each factor. The weighting factors were then reviewed and modified by independent reviewers, regulators, and a citizens' focus group. The final weights appear in Table 3.

The weighted technical scores were summed. The total fell between 0 (least preferable) and 100 (most preferable). The sums enabled the treatment option to be ranked according to the technical weighted score. Then, the weighted life cycle cost data were added to the technical weighted score in a way that ensured that the cost of a treatment facility was equitably apportioned among the waste streams that would be processed using that facility. Inclusion of the weighted life cycle cost data resulted in a total weighted score. The IDOA model generated the technical and total weighted scores for each treatment option. These IDOA model scores were useful tools to narrow the entire population of options.

- The IDOA model ensured that the same attributes were analyzed for every process or facility.
- The IDOA model provided some guidance to help make analyses consistent among the facilities.
- The IDOA model enhanced the engineering assessment by incorporating consistent structure and logic.

The application of the IDOA model assures a certain level of consistency and completeness in performing the in-depth analysis of the potential treatment options associated with each waste stream. The primary function of the model is to narrow down the entire universe of possible treatment options to a more manageable number for further analysis and review. The model was not developed to provide a clear PO winner, and the reader is cautioned against believing that the treatment option having the best model score is the PO. On the contrary, the application of the model results in a smaller set of options that may have model scores within a 10 to 15% range of each other, that serve as the focus of further analysis. It was not expected, and in practice has not always been the case, that the treatment with the best model score is the PO.

Several of the waste streams also have treatment options proposed by outside vendors. Many of these vendors' options, however, remain unproven technologically. The vendors have primarily offered to perform studies to demonstrate that their technology can produce a waste form that will meet Land Disposal Restrictions (LDR). A separate task team is working with the vendor proposals to determine which technologies appear worthy of further investigation. As rapidly as procurement rules allow, and as completely as budgetary constraints permit, contracts are being made with vendors to pursue the most promising innovative treatment methods.

Nonetheless, the technical viability of these technologies has been assumed and vendor processes have been hypothesized to permit application of the IDOA model and development of a comparison of the potential vendor processes with other treatment options.

In the months ahead, successful vendors' studies will be translated into actual process designs that can be compared with the preferred options selected. This comparison will solidify the conclusions drawn from the hypothetical vendors' processes, and may reveal a vendor treatment technology for a waste stream that is preferable to the option previously favored.

Table 3 – Attributes and Enabling Statements For Options Analysis

Wt.	Attribute	High Score Median 80	Medium Score Median 50	Low Score Median 20
22%	PROCESS PARAMETERS			
5%	Volume Alteration	Factor of 5 reduction of waste.	Volume is maintained at 1:1 after processing.	Volume is increased by a factor of 2 or more after processing.
4%	Secondary Waste Generation	Small quantity is produced, all of which can be handled by existing technologies.	An additional amount of waste, in the range of 10%, is generated, which can be handled by existing technologies.	Large quantities produced, or existing technologies not available for treatment.
2%	Destruction Removal, and Demobilization Efficiency	All applicable LDR standards are met.	Additional LDR treatment is required for some of the constituents; technology exists.	Additional treatment is required to meet requirements, and technology does not exist, or requires modification.
3%	Flexibility	The process can treat waste streams of similar compositions to that assumed as a design basis without producing a final waste form that fails to meet requirement. Moreover the process does not need to be reconfigured or monitored with special care to meet throughput specifications.	The process can treat waste streams of similar compositions to that assumed as a design basis without producing a final waste form that fails to meet requirement, but the process must either be reconfigured or monitored with special care to meet throughput specifications.	The process cannot treat waste streams of compositions that differ from that assumed as a design basis. Special care must be taken to monitor influent streams to ensure that they conform to the composition assumed as a design basis.
2%	Ability to be Shipped	Treatment residuals meet shipping requirements without any additional treatment.	Treatment residuals require simple physical treatment to meet shipping requirements.	Treatment residuals require extensive treatment to meet shipping requirements or technologies do not exist.
6%	Final Waste Form	Meets the expected disposal WAC.	Final forms require additional treatment to meet disposal WAC; technologies exist.	Significant additional treatment is required before disposal, or technologies do not exist.
19%	ENGINEERING PARAMETERS			
13%	System Implementability	Most of the elements and processes have been previously demonstrated on similar uses and applications.	50% or fewer of the elements have been previously demonstrated on similar uses and applications.	Few or none of the elements have been demonstrated.
3%	Availability	Key components arranged in similar systems have resulted in availability of greater than 80%.	Process is expected to be available about 50% of the time.	Process is expected to be available about 20% of the time, or large uncertainties exist in ability to predict availability.

Table 3 - Attributes and Enabling Statements For Options Analysis (contd)

Wt.	Attribute	High Score Median 80	Medium Score Median 50	Low Score Median 20
1%	Scalability	Process can be easily expanded to take advantage of economies of scale. Also, process could be scaled from laboratory scale directly to plant scale.	Process can accept a range of input but has limitations for expansion. Also, pilot scale tests are required for meaningful testing before plant-scale design.	Process cannot be expanded to take advantage of economies of scale. Also, laboratory or pilot scale testing impractical, or would not yield meaningful results. Plant-scale design must come directly from engineering calculations.
1%	Remedial Measures	Process failure or malfunction does not create a waste that cannot be treated by other means; alternative treatment methods for the original waste exist and can be implemented within three months of recognition of need.	Process failure or malfunction creates other wastes that must be characterized to determine treatability; alternative treatment methods must be developed to treat new waste created by the process malfunction.	Process failure or malfunction creates other wastes for which there is no known treatment; no alternative methods for treatment of original waste exist.
1%	Schedule For Treatment of Waste	A schedule for addressing and processing waste can be determined with high confidence.	Some technology issues can result in uncertainty in schedule development. System complexities may negatively impact schedule duration.	Availability, technology, or flexibility issues severely limit confidence in developing schedules. Extensive training, system and operational complexity may also create problems.
20%	PERSONNEL PARAMETERS			
6%	Consequence of Unmitigated Accident Scenarios	Little or no facility emissions for routine operations or under all but the most catastrophic accidents.	Little or no emissions for routine operations, but significant releases under most accident scenarios.	Marginally acceptable releases under routine operations or extensive releases under most accident scenarios.
6%	Non-Operational Worker Potential Exposure	Significantly less [sic.] number of workers required to construct and decommission a facility with the proposed process, as compared to other technologies, plus lower than average non-routine maintenance.	Average number of workers and non-routine maintenance required.	More complex than average facility construction, non-routine maintenance and decommissioning.
6%	Operational Worker Potential Exposure	Significantly fewer workers potentially exposed or potential exposure much lower than average.	Average number of workers and potential exposure levels.	Greater than average number of workers or greater than average potential exposure to the work force.

Table 3 - Attributes and Enabling Statements For Options Analysis (contd)

Wt.	Attribute	High Score Median 80	Medium Score Median 50	Low Score Median 20
2%	Transportation Potential Exposure	No transportation of treated or untreated waste required.	Limited additional characterization required to support transportation, no new packaging/certification facilities required, and limited number of waste transports required.	Significant additional waste characterization required for transportation, new packaging/ certification facilities required, large number of waste transports needed, or large number of miles required for each waste shipment.
14%	REGULATORY PARAMETERS			
4%	Need For Variance	Processes are in full compliance with all applicable regulations with little or no difficulty or with no process modifications.	Processes are in partial compliance with all applicable regulations with little or no difficulty. Full compliance may be achieved through requests for variances or with limited modifications to the process.	Majority of the applicable regulations cannot be met without vast modifications to the process, or other extensive variances.
6%	Ability To Obtain A Permit	Permitting process is well-defined and relevant precedents for success have been established. Similar processes have been previously permitted by the regulatory agencies (primarily South Carolina Department of Health and Environmental Control (SCDHEC)) with little or no difficulty.	Process or key elements have been permitted elsewhere, but some key differences may exist (for example, differences in waste streams, or waste stream characterization). Similar processes have been previously permitted by the regulatory agencies (primarily SCDHEC) with moderate difficulty.	Unproved technology or significant new arena of application or need for multiple permits build in substantial permitting barriers. Similar processes have been previously permitted by the regulatory agencies (primarily SCDHEC) with extreme difficulty, or have never been previously permitted.
4%	Waste Disposal	80% of both primary and secondary wastes have been rendered non-hazardous. The other 20% remain hazardous.	50% of both primary and secondary wastes have been rendered non-hazardous. The other 50% remain hazardous.	80% of both primary and secondary wastes remain hazardous. The other 20% have been rendered non-hazardous.

Table 3 – Attributes and Enabling Statements For Options Analysis (contd)

Wt.	Attribute	High Score Median 80	Medium Score Median 50	Low Score Median 20
9%	PUBLIC ACCEPTANCE			
9%	Public Acceptance	Stakeholders accept the process and the risks – similar processes have been publicly acknowledged by stakeholders as being acceptable.	Some stakeholder concerns that could affect successful utilization of the technology – stakeholders have publicly stated reservations about the safety or effectiveness of similar processes.	Significant stakeholder concerns about process – stakeholders have publicly stated disapproval about the safety or effectiveness of similar processes, or stakeholder opinion is unknown.
Wt.	Attribute			
15%	COST CONSIDERATIONS			
14%	Life Cycle Cost <i>Costs Developed According To DSTP Cost Guidance Rev. 1.</i> Costs are estimated for: <ul style="list-style-type: none"> • Pre-operating costs • Facility costs • Operating and maintenance costs • Disposal cost • Decontamination and decommissioning costs <p>The SUM of the above costs is assigned a score in proportion to where it falls between \$1 and \$35 million. The higher the cost, the lower the score. Any cost totaling more than \$35 million receives a score of zero.</p>			
Wt.	Attribute	High Score Median 80	Medium Score Median 50	Low Score Median 20
1%	Funding Availability	Life cycle costs can be supported within target budget.	Life cycle costs can be supported with less than 10% increase in target funding levels.	Line item funding required at high levels.
1%	INDUSTRY INVOLVEMENT			
0.5%	Market For Technology	Numerous markets are identified within and outside DOE – more than three DOE and commercial nuclear facilities have similar wastes.	More than one market is identified within and outside DOE – two DOE and commercial nuclear facilities have similar wastes.	No markets or needs are identified – SRS waste is unique.
0.5%	Private Sector Involvement	Private sector technology company is identified with experience and interest and the company has experience in permitting activities – a vendor has submitted a proposal and has permitting experience.	A private sector party has expressed an interest; however, has little or no experience in this type of activity or permitting process – a vendor with non-technical experience has submitted a proposal.	No private sector companies have expressed an interest or a need for the technology.

Engineering Assessment

The last step in the IDOA was to perform an engineering assessment, taking into account the score generated by the IDOA model. While application of the IDOA model analyzed the degree to which the treatment option satisfied the requirements of the prescribed attributes, engineering assessment took a broader perspective. The engineering assessment considered other less tangible factors without which any decision making process would be shallow and superficial. The engineering assessment identified the preferred option.

1.3 Assumptions

This section contains assumptions made in the development of the SRS DSTP.

DOE Assumptions

All sites used the following assumptions to provide a degree of consistency in the preparation of the DSTP. The assumptions were developed as a part of the "Draft Site Treatment Plan Development Framework" and reflect review and comment from the states and EPA.

1. High level waste (HLW) will continue to be managed according to current plans at each site (i.e., Hanford, West Valley, Savannah River, INEL). Primarily due to potential safety concerns, HLW will not be transported offsite except as a treated stable waste that is ready for disposal. The DSTPs will not change management strategies for HLW.
2. Regarding defense related TRU waste, the DSTPs will reflect DOE's current strategy on the Waste Isolation Pilot Project (WIPP) opening and receipt of a No Migration Variance. The DSTPs should identify characterization, processing, and treatment of TRU waste to meet the WIPP Waste Acceptance Criteria. Consistent with this policy, treatment of mixed TRU waste to meet Land Disposal Restriction (LDR) standards should not be included in the DSTPs.

However, the STPs will recognize that DOE's policy regarding WIPP is under review and may change in the future. As such, the STPs should provide for the flexibility to modify activities and milestones regarding TRU waste to reflect potential future changes in DOE policy.

Under current DOE policy, non-defense related TRU waste will not be disposed at WIPP. As such, the DSTPs should reflect LDR treatment of non-defense mixed TRU waste.

3. DOE recognizes some state's preference for treatment of all wastes onsite. Where appropriate, existing onsite capacity will be utilized before new facilities are constructed. When Onsite treatment or use of commercial or mobile facilities is not practicable, the use of existing offsite capacity, as well as the construction of new facilities, will be considered.
4. Sites in the same state will investigate the practicality of consolidating treatment facilities.
5. Mixed waste resulting from Environmental Restoration (ER) and Decontamination and Decommissioning (D&D) activities will be factored into planning activities and equity discussions to the extent known, particularly where utilization of facilities in the DSTP are being considered for managing ER and D&D waste. The DSTP will propose strategy for the inclusion of ER and D&D mixed waste streams.
6. The DSTPs will address all wastes in the updated Mixed Waste Inventory Report (MWIR). Any changes /corrections to the MWIR waste streams and treatment facility information will be explained in the DSTP.

7. On a volume basis, the large majority of DOE's mixed waste will be treated Onsite. Because of transportation concerns and costs, this includes process wastewater, and some explosives and remotely handled waste. In addition, other large volume waste streams will generally be treated onsite. At a minimum, Richland (RL), Oak Ridge (OR), Idaho (ID) and Savannah River (SR) will have onsite facilities to treat the majority of their wastes.
8. The Programmatic Environmental Impact Statement (PEIS) is being performed in parallel with the development of the STPs. The DSTP process will provide information to the PEIS. Each site will prepare any necessary specific NEPA documentation before proceeding with a given project or facility ordered by the state or EPA as a result of the STP process.
9. In support of DOE's cradle to grave waste management philosophy, disposal site location and criteria will be factored into state equity discussions, waste treatment facility designs, and the characteristics of the final waste forms.

In addition to the general DOE complex-wide assumptions, SRS has developed site specific assumptions for use in developing the DSTP. These assumptions are listed below.

General Assumptions

1. To the extent possible, all waste streams in the Mixed Waste Inventory Report will have a preferred treatment option identified and/or option analysis complete in the DSTP. Those waste streams without a preferred treatment option will have a schedule for the development of the preferred option.
2. All Savannah River Site high-level waste will be treated onsite.
3. ER, Transition, and D&D waste streams will be addressed in the Draft Site Treatment Plan to the extent that they are known. ER waste streams from Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) sites will not be analyzed in the site treatment plan until a Record of Decision has been reached for the particular remediation project. Known waste streams from Resource Conservation and Recovery Act (RCRA) waste sites will be addressed. Methodology for modifying the Draft Site Treatment Plan for new ER, Transition, and D&D waste streams will be incorporated into the text of the document. SRS is in negotiations on the classification of Investigation Derived Waste (IDW). IDW is not anticipated to be included in the DSTP.
4. If existing onsite treatment capacity is available for a particular waste stream no further analysis will be performed for that waste with the exception of waste streams going to the Consolidated Incineration Facility (CIF) (In order to be responsive to stakeholders, alternatives to incineration are being addressed.) Existing mixed waste treatment facilities are those facilities at SRS that are either 1) presently operating or 2) under construction having been issued regulatory operating or construction permits. Existing mixed waste treatment facilities at the Savannah River Site include, Savannah River Laboratory High Activity and Low Activity Treatment Tanks, M-Area Liquid Effluent Treatment Facility, F- and H-Area Effluent Treatment Facility, and Z-Area Processing Facility. Mixed waste treatment facilities under construction with appropriate environmental permits at Savannah River Site include Defense Waste Processing Facility and Consolidated Incineration Facility. Existing non-RCRA disposal facilities include the E-Area Vaults and the Z-Area Saltstone Disposal Vaults.
5. Treatment options analysis will not be performed in the DSTP for the six original streams to be treated by the M-Area Vendor Treatment Process. Options analysis was conducted previously and resulted in the selection of this treatment process which produces a superior waste form. Additionally, this is a temporary vendor facility and

may operate for less than 5 years. Other SRS waste streams for which this technology is appropriate treatment will be considered.

6. Treatment schemes such as treatment in containers or containment buildings will be investigated.
7. The Draft Site Treatment Plan will not address moratorium waste in the preferred option analysis process.
8. The level of detail for option analysis will vary in the Draft Site Treatment Plan from waste stream to waste stream.
9. The five year window for waste forecasting will continue to be used as established in the final MWIR (1993 through 1997).
10. Cost and schedule analyses will be performed for the viable options only. Viable options are those which in-depth technical analysis have determined to present a reasonable potential to become the preferred treatment option for that waste stream.
11. Determination of viable options for in-depth option analysis to determine the preferred option will be limited to options which meet the Land Disposal Restriction requirements.
12. For the flow diagrams, after the waste has been removed from the containers, the containers will be considered "empty" according to 40 CFR 261.7 thus requiring no treatment.
13. Waste stream letter suffixes (e.g., SR-W041A, SR-W041B, etc.) designate separate and distinct waste streams.

In-Depth Options Analysis Assumptions

1. For the purpose of this analysis, the CIF will be defined as including incineration, neutralization, and stabilization of a waste stream. The waste feed stream will either consider liquid feed incineration, solid feed incineration, liquid feed stabilization or solid feed stabilization. The resultant waste form of each incineration feed stream will be stabilized.
2. For Waste Stream SR-W013, LLW Lead, it is assumed that 50% of the waste stream volume can be recycled while the remaining 50% will require disposal.

Estimating Assumptions

1. Moderate hazard HW/MW building (approx. 12,500 ft² primarily to handle tritiated waste) cost = \$9,000,000.
2. Low hazard HW/MW building (approx. 100,000 ft²) cost = \$27,000,000.
3. Refurbishment of a containment building = \$4,000,000.
4. Containment building renovation cost \$400/ft²; area for a containment building = 10,000 ft² (q.v. Assumption #6). Renovation required not only to make building useful but also to meet DOE Order requirements.
5. As many as (4) processes can occupy the same containment building.

6. Refurbishment costs include:
 - installation of process equipment
 - all utilities
 - decontamination as needed
 - equipment in common use (e.g. fork lifts, ventilation)
 - bringing building up to 6430.1A specifications
7. Tritium containment refurbishment cost = \$1,000,000.
8. Operations and Maintenance (O&M) costs based on:
 - Vendor or SRS operation of the process.
 - If vendor processing, amount of SRS support needed for vendor.
 - Complexity of the process.
9. Disposal cost based on the expected volume and type of waste. Vendor disposal costs based on expected volume derived from knowledge of the vendor process and the final waste form. LLW disposal cost \$17/ ft³, based on the volume and capital cost of the low activity vaults and HW/MW disposal cost \$215/ft³, based on information on p. 38 of *FY 1993 SRS Waste Cost Analysis (U)* (document WSRC-RP-93-942, Revision 1).
10. RCRA Part B permit cost = \$1.5 million, including the cost of developing a compliance demonstration under South Carolina R.61-104.
11. RCRA Part A permit cost = \$125,000
12. Wastewater Permit Cost = \$125,000
13. Resource recovery requires no processing permit.
14. Containment building modifications to a canyon (i.e., SR-W009) = \$500,000.
15. Tankage etc. will be added to M-Area acid treatment of cadmium coated filter frames to cover miscellaneous expenses.
16. On waste stream SR-W034, the vendor will require a space to be provided, but SRS can install the process in a laboratory, which is inaccessible to a vendor. Thus SRS building costs are less than the vendor's.
17. SR-W051 waste filter cartridges are contaminated with mercury. A space exists onsite in which the cartridges can be transferred from storage boxes to cardboard boxes for incineration without incurring additional building refurbishment costs.
18. The type of RCRA disposal (Sub-part C or Sub-part D) has little or no impact on the assumed disposal costs in a preliminary planning estimate.
19. Floor space exists at tritium to install a mercury still in a glove box, and connect the glovebox to existing tritium control system = \$1 million.
20. Decommissioning and decontamination costs = 80% of capital cost.
21. Closure and post-closure costs = 5% of disposal costs.
22. Additional waste streams sent to CIF for incineration will not increase the cost of decommissioning and decontamination either of the incinerator, or the ashcrete facility.

23. For those waste streams for which IDOAs were done, when the cost of a small volume waste was "included with" the cost of a large volume, the small volume waste's prorated share of the total cost was so small that it was for practical purposes assumed to be zero.

DSTP cost estimates and assumptions were based on information that appears in these documents:

1. "M-Area Waste Disposal Alternative Economic Evaluation," EWR 867173 WSRC SE, B. J. Collins, January 1991.
2. "Economic Study of M-Area Waste Disposal Alternatives (U)," NMP-RMT-91-0108, H. L. Martin & J. B. Pickett, April 22, 1991.
3. "Waste Preparation Facility Planning Estimate Capital and Operating Cost," WSRC-RP-91-631, D. K. Noller, June 6, 1991.
4. *Cost Guide, Economic Analysis: Methods, Procedures, Life Cycle Costing, and Cost Reviewing/Validating*, DOE/MA-0063, Volume 1. January, 1982.
5. "Hazardous Waste/Mixed Waste Treatment Building Throughput Study (U)," WSRC-RP-91-1220, J. L. England & J. P. Kanzleiter, December 18, 1991.
6. *SRS Mixed Waste Characterization Catalog for the HW/MW DF*, WSRC-TR-90-226, M. S. Hay, et. al., May 31, 1990.
7. *A Perspective of Hazardous Waste and Mixed Waste Treatment Technology at the SRS (U)*, WSRC-MS-91-117, J. L. England et. al., June 28, 1991.
8. "Preliminary Planning Cost Estimate for Vitrification Alternatives of Mixed Waste (U)," WSRC-RP-92-1209, J. L. England, October 15, 1992, Rev. 0.
9. "Feasibility Study for the Evaluation of Leachate Treatment at Existing Wastewater Treatment Facilities at SRS (U)," WSRC-RP-91-811, October 15, 1991, J. L. England, et. al., Rev. 0.
10. "Life Cycle Cost Analysis Changes Mixed Waste Treatment Program at the SRS, WSRC-MS-92-346, J. B. Pickett, et. al.
11. "F/H Area Seepage Basins Abandoned Process Sewer Lines Outside the Security Fence Preliminary Screening Treatment Alternatives Study (U)," WSRC-RP-92-839, J. L. England, June 30, 1992, Rev. 0.

Various Costs For Treatment Options

This section contains equipment costs, fees, and building modifications for input into cost estimates.

SR-W009

(Cost x \$1000)

Containment Building or HW/MW – Stainless Steel Box

Drum opener	5
Remote drum handling equipment/crane	200
Welding equipment	0
Health protection equipment	350

Containment Building – Metathesis

Drum opener	5
Remote drum handling equipment/crane	200

Welding equipment	0
Health protection equipment	350
Reactor vessel and piping	500

Vendor – Polymer

1/2 containment building	2000
Vendor fee	4000

Vendor – Cement

Cement stabilization will require 1/2 containment building	2000
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SR-W011

M-Area

Tankage	100
Material handling equipment	100
1/2 of cost to restart M-Area after completion of original contract	1000

Containment Building or HW/MW – Stainless Steel Box

Welding equipment	50
Material handling equipment	100
1/4 containment building	1000

HW/MW

Welding equipment	50
Material handling equipment	100
1/4 low hazard HW/MW	7000

SR-W013

Containment Building – Macroencapsulation

Material handling equipment	100
Polymer storage, transfer, extruder, evaporator	3500

HW/MW – Macroencapsulation

Material handling equipment	100
Polymer storage, transfer, extruder, evaporator	3500
1/4 low hazard building cost	7000

Containment Building – Decontamination

Material handling equipment	100
Tankage	200
Precipitation system	500
Filter system	100
Stab. system	100
Pumps and piping	150

SR-W014

Containment Building – Distill/Reuse

Material handling equipment	100
Assay equipment	350
Still/condenser	200
Pumps and piping	150
Connection with Tritium offgas system	200
Nitrogen purge system	150
Glove box	100
Tritium containment building refurbishment	1000

Containment Building or HW/MW – Amalgamation

Material handling equipment	100
Assay equipment	350
Still/condenser	200
Pumps and piping	150
Connection with Tritium offgas system	200
Amalgamation equipment	200
Tritium containment building refurbishment	1000
1/3 moderate hazard HW/MW	3000

SR-W015

Containment Building or HW/MW

Waste handling equipment	50
Welding equipment	50
1/4 cost of containment building refurbishment	1000
1/3 cost of moderate hazard HW/MW	3000

Containment Building – Roast & Retort

Saw	5
Glovebox	25
Waste handling equipment	50
Hg oven & condenser	300
Assay equipment	500
Piping	150
Connection with Tritium offgas system	200
Containment building refurbishment	2000

SR-W018

M-Area – Vitrification

Saw	5
Glovebox	25
Vitrification overheads (electricity)	100
Work prep area	100
Vendor fee (70k gal x \$10/gal)	700

CIF – Ashcrete

Shredder	100
Material handling equipment	100
Packaging equipment	100
1/4 containment building for shredder	1000

Containment Building or HW/MW – Stainless Steel Box

Welding equipment	50
Material handling equipment	100
1/4 containment building	1000
1/4 low hazard HW/MW	7000

CIF – Incineration

Shredder	100
Material handling equipment	100
Packaging equipment	100
1/4 containment building for shredder	1000

SR-W031

Vendor – Polymer & Cement

No containment building overhead cost assigned to this waste because of its small volume.

Containment Building – In-Drum Stabilization

1/2 refurbish in-drum stabilization equipment (see SR-041 aqueous Pb)	50
1/2 health protection equipment	175

M-Area – Vitrification

Vendor fees	10
Work area preparation	100

SR-W034

Containment Building – (Lab) Oxidation

Material handling equipment	50
Reactor	50
Pumps and piping	50
Lab refurbishment	100

Vendor – Oxidation

1/4 containment building refurbishment	1000
Vendor fee	250

M-Area – Acid Leaching

Tankage	100
Material handling equipment	50
Pumps and piping	100

Vendor – Encapsulation

1/4 containment building refurbishment	1000
Vendor fee	4000

SR-W041A Aqueous Lead

Vendor – Precipitation

Vendor fee	250
1/4 containment building	1000

Containment Building – In-Drum Stabilization

1/2 refurbish in-drum stabilization equipment (see SR-W031)	50
1/2 health protection equipment	175

SR-W041B Elemental Mercury

Containment Building – Distill/Reuse

Material handling equipment	100
Assay equipment	50
Still/condenser	200
Pumps and piping	150
Ventilation system	200
1/4 containment building refurbishment	1000

Containment Building or HW/MW – Distill/Amalgamate

Amalgamation equipment	200
Material handling equipment	100
Assay equipment	50
Still/condenser	200
Pumps and piping	150
Ventilation system	200
1/4 containment building refurbishment	1000
1/3 cost of moderate hazard	3000

SR-W042

CIF – Incineration

Solvent still	5
Sawdust mixing equipment	10
1/4 containment building	1000

SR-W047

M-Area – Wastewater Treatment and Vitrification

Work area prep	100
Tankage	100
Pumps & piping	100
Clarification/filtration system	500
Vendor fee	1000
Electricity	100

M-Area – Vitrification

Work area preparation	100
Tankage	100
Pumps & piping	100
Vendor fee	3000
Electricity	300

CIF – Recycle to Ash Tank

Piping	100
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SR-W048

M-Area – Vitrification

Material handling equipment	100
Electricity	50
Vendor fees	50
Work area preparation	100
1/2 of cost to restart M-Area after completion of original contract	1000

Vendor – Cement

Vendor fee	1500
Entire containment building	4000

Vendor – Polymer

1/2 containment building	2000
Vendor fee	750

Vendor – Soil Washing

Vendor fee	2500
1/2 containment building	2000

Vendor -- Chelation

Vendor fee	1500
1/2 containment building	2000

HW/MW -- Soil Washing

Material handling equipment	100
Tankage	300
Settlers/clarifiers	300
Pumps and piping	300
Agitators	100
Size reduction equipment	100
Stabilization equipment	200
1/4 low hazard HW/MW	7000

SR-W049

CIF -- Ashcrete

Material handling equipment	100
Size reduction equipment	100
1/4 containment building	1000

SR-W055

CIF -- Incineration

Material handling equipment	100
Packaging equipment	100
Shredder	100
1/4 containment building for shredder	1000

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2.0 TREATMENT FACILITIES AND TREATMENT TECHNOLOGIES

2.1 Existing Facility Descriptions

This section describes existing SRS facilities considered in options analysis. It should be noted that the contract for M-Area Vendor Treatment Process has been awarded, so it is considered "existing" even though the equipment has not been installed.

2.1.1 M-Area Liquid Effluent Treatment Facility (LETF)

Facility Description

M-Area LETF consists of three closely related processes:

1. Chemical Transfer Facility (CTF)
2. Process Waste Interim Treatment/Storage Facility (PWIT/SF)
3. Dilute Effluent Treatment Facility (DETF)

Chemical Transfer Facility (CTF)

CTF treated concentrated spent process solution from reactor materials production facilities. The only part of CTF now in use is a slurry tank and pumps, in which DETF filter cake is mixed with caustic and pumped to PWIT/SF. CTF operates under a SCDHEC Industrial Wastewater Treatment Permit.

Process Waste Interim Treatment/Storage Facility (PWIT/SF)

PWIT/SF is a SCDHEC Interim Status Hazardous Waste Treatment and Storage facility. The facility employs six 35,000 gallon storage tanks and four 500,000 gallon storage tanks. These tanks contain waste slurry that has separated into a thick sludge and a clear supernatant liquid. Supernatant liquid is treated in the DETF, and the sludge is treated by vitrification, which will be described, presently.

Dilute Effluent Treatment Facility (DETF)

DETF is an industrial wastewater treatment facility using EPA's Best Demonstrated Available Technology (BDAT) for metal finishing and aluminum forming industries. This treatment precipitates metal ions from dilute wastewater and separates the precipitate by filtration. The filter cake is transferred to PWIT/SF via CTF, where it is stored awaiting vitrification. The filtrate is collected and analyzed. If it meets NPDES release specifications, it is discharged to a surface stream.

Capacity

LETF is permitted to release 86,000 gallons per day to surface water. The facility throughput depends on the amount of suspended solids in the stream feeding the filters. Currently, the amount of filtrate released while processing the supernatant liquid from PWIT/SF is 38,000 gallons per day.

2.1.2 M-Area Vendor Treatment Process

A contract has been awarded to a sub-contractor to design, build, and operate a vitrification process, which will transform M-Area wastes into a form meeting the land disposal restrictions. M-Area wastes that make up the design basis for the vitrification process are:

- M-Area plating line sludge from supernatant treatment (PWIT/SF sludge)
- M-Area high nickel plating line sludge (PWIT/SF sludge)
- M-Area treatability test samples

- Filter cake from the Mark 15 filters
- Nickel plating line solution
- Plating line sump material

Facility Description

The above wastes will be blended into a homogeneous mixture in existing tanks in M-Area. Stabilizing chemicals and glass-forming materials will be added to the mixture to make vitrifier feedstock. The feedstock will be pumped into a melter at a temperature of 1150°C. The glass-forming materials chemically bond and microencapsulate the constituents of concern into a matrix of borosilicate glass. The glass is placed into containers for storage and disposal. The entire operation takes place in a structure that has secondary confinement apparatus and air emission control equipment.

Capacity

The vitrifier is sized to treat the entire volume of design-basis waste in one year. It has a nominal glass output of 5 tonnes per day and a maximum production of 7.5 tonnes per day. While the vitrifier is treating the design basis waste, it has no excess capacity. Nevertheless, after the design-basis waste is treated, the vitrified will have about one additional year of service life left. The remaining service life could be used to treat other waste streams, provided such arrangements can be made with the vendor, and M-Area remains operational.

2.1.3 Consolidated Incineration Facility (CIF) and Ashcrete Stabilization Facility

CIF receives both solid and liquid wastes from several generators around the SRS. One of CIF's primary design-basis waste streams is benzene from the Defense Waste Processing Facility. Liquid waste can arrive by container or by pipeline. Solid waste arrives packaged in a cardboard box 21 inches on each side.

Facility Description

CIF is a rotary kiln incinerator with a secondary combustion chamber. The liquid waste is fed into the rotary kiln's primary combustion chamber and the secondary combustion chamber. Solid wastes are fed into the primary combustion chamber. Organic materials are combusted to water and carbon dioxide. Offgas is quenched, scrubbed, and released to the atmosphere.

Non-combustible materials (ash) are captured, mixed with Portland cement, and other stabilizing additives, and cast into stable solid waste forms (ashcrete). The ashcrete system also stabilizes blowdown liquid from the quench and scrubber (blowcrete). The ashcrete system could be used to encapsulate other small sized wastes, which could be mixed directly with the ash.

Capacity

The CIF thermal capacity of 18.1 million BTU/hr is based on the design estimate of wastes expected to be inventory at the time of CIF startup and wastes expected to be generated annually after CIF startup (OPS-WPM-90-4140). In order to maximize the flexibility and utilization of the CIF, the material handling systems for feeding solid and liquid waste were sized for a greater throughput than the average annual requirement for each system. The instantaneous capacity of each system is:

• Solid waste to rotary kiln	2025 lbs/hr
• Organic liquid waste to rotary kiln	385 lbs/hr
• Aqueous liquid waste to rotary kiln	950 lbs/hr
• Organic liquid waste to secondary combustion chamber	302 lbs/hr

The CIF can generally treat any combination of liquids and solids up to the rates listed above provided that the thermal capacity and other operational limits are not exceeded.

In 1993 the CIF utilization was re-estimated in the CIF Mission Need and Design Capacity Review. Utilization in 1996 was predicted to be 60% for solid waste and 20% for organic liquid waste. Out-year utilization was estimated to increase as the scope of the SRS Environmental Restoration and Decontamination and Decommissioning missions increase. Starting in the year 2001 annual utilization was predicted to occasionally approach 75% for solids and 100% for organic liquids. However, a varying amount of spare capacity is expected to usually be available for the treatment of other DOE incinerable mixed wastes. The schedule for treating other wastes at CIF will be established based on several key factors including:

- available thermal capacity
- concentrations of waste constituents, e.g., hazardous metals, that are controlled by the various CIF environmental permits
- concentrations of waste constituents, e.g., chlorides and noncombustibles, that directly influence the amount of bottom ash and offgas scrubber blowdown generated. When wastes that generate significant ash or blowdown are incinerated, the demand on the spare ashcrete unit capacity could become the factor that limits waste feed rates.

2.1.4 Savannah River Technology Center Ion Exchange Treatment Probes for Low and High Activity Waste Streams

Savannah River Technology Center (SRTC) ion exchange treatment probes treat wastes that are captured in laboratory waste storage tanks located in the laboratory complex.

Facility Description

The treatment probes remove chromium (III), lead, mercury, and benzene from low level and high level mixed waste. The entire probe, developed by SRTC, is placed in the waste tank and the waste solution pumped through it. The probes contain ion exchange resins that adsorb the constituents of concern.

After the probes remove the hazardous characteristics, the decontaminated solution is sent to another low-level waste treatment facility for volume reduction, and disposal as a low-level waste. The constituents of concern are bound so tightly to the resins that studies indicate the resin will pass TCLP, so the spent resin also becomes a non-hazardous low-level waste.

Capacity

The RCRA Part A permit modification, under which the probes operate, limits the throughput of the mixed waste storage tank treatment process (both low and high-level waste streams) to 457,229 gallons per year. The treatment capacity of the probes in low-level waste service is 396,300 gallons per year.

2.1.5 Defense Waste Processing Facility (DWPF)

DWPF will receive high-level waste from tank farms in the defense materials production areas. High level defense waste is as radioactive as material from reprocessing spent nuclear fuel. This waste includes liquids, sludge, and precipitated materials in slurry. High level waste contains transuranic elements and fission products.

Facility Description

DWPF has two treatment processes:

1. A chemical process hydrolyzes the precipitate slurry into a low radioactivity, organic liquid (primarily benzene) and a high radioactive aqueous stream.
2. A vitrification process treats the aqueous stream, and high radioactivity sludge to remove mercury, mixes the streams with additives and glass-forming materials, and continuously feeds a high temperature in a melter in which the materials fuse into borosilicate glass.

The organic liquid goes to CIF for incineration. The borosilicate glass, which bonds with and encapsulates the constituents of concern, is placed in a stainless steel canister for storage.

Capacity

According to the Mixed Waste Inventory Report the maximum technical capacity for the system is approximately 2 million pounds per year.

2.1.6 Effluent Treatment Facility (ETF)

ETF is a multi-purpose plant for treating highly dilute aqueous wastes. Waste arrives at ETF by pipeline. Plans are also underway to provide a station at which liquid waste in containers can be unloaded. The treatment option of interest for treating mixed waste streams is the ion exchange process.

Facility Description

A treatability study determines the most effective type or types of ion exchange resin that will be used to adsorb the constituents of concern. The waste is pumped from the feed tank to the ion exchange beds. The constituents of concern are bound so tightly to the ion exchange resins that studies indicate the resin will pass TCLP, so the spent resin also becomes a non-hazardous low-level waste. Decontaminated liquid effluent is collected in check tanks for analysis, which confirms the liquid meets release specifications. Liquid that meets specifications is released to a surface outfall. In the unlikely event that the treated effluent fails to meet release specification, it can easily be recycled to the feed system for reprocessing. Nothing is released from ETF without passing a final assay.

Capacity

Design throughput of ETF is about 130 gpm. At present ETF is processing about 40-50 gpm average. Acceptance of waste streams at ETF must be on a case by case basis, depending on the quantity of waste and concentration of the constituent of concern. ETF's waste acceptance criteria (WAC) requires the influent to be almost pure water, or in quantities small enough that the constituent of concern is significantly diluted when the waste is added to the process feed tank.

2.1.7 Z-Area

Z-Area receives liquid waste by pipeline directly from Tank 50 in the Tank Farm. The contents of Tank 50 are analyzed before transfer to ensure they meet Z-Area's stringent WAC.

Facility Description

In Z-Area liquid waste is blended with Portland cement and other additives to form grout. The grout slurry is transferred to engineered underground disposal vaults. In the vaults, the grout solidifies into a stable final waste form, which meets land disposal requirements. The

constituents of concern are immobilized by the grout and rendered non-hazardous. Although manufacturing grout causes Z-Area to be defined as a "treatment facility," the strict WAC preclude its use to treat any but the specific waste in Tank 50. Z-Area is better regarded as a "disposal facility."

Capacity

According to the Mixed Waste Inventory Report, Z-Area has a design feed rate of approximately 22 million gallons per year. Permitted feed rate is approximately 15 million gallons per year. Normal operating rates are approximately 2.5 million gallons per year. Each vault has a capacity of approximately 11 million gallons.

2.1.8 Tritium

The tritium facility produces tritium gas (a radioactive form of hydrogen). Tritium is not a waste treatment facility *per se*. It does, however, have tritium control and recovery equipment, which could be needed if wastes contaminated with tritium were treated. Any treatment process handling tritiated waste would either have to use the control equipment at the tritium facility or construct it anew.

2.2 Process Descriptions

This section contains descriptions of the treatment technologies considered in the options analysis.

2.2.1 Acid Leaching

The acid leaching process is designed to solubilize heavy metal contamination. The prepared and sorted waste is placed in a series of tanks containing acid solution. The waste is agitated to ensure thorough mixing and saturation. After a specified contact period, the leachate and solids are separated. The solids are washed to remove soluble metals, followed by dewatering, required for final disposal. The leachate stream is sent to the wastewater treatment process where the dissolved metal is precipitated as an insoluble hydroxide. The detoxified material is repackaged in final disposal containers.

2.2.2 Amalgamation

Amalgamation is a process applicable to radioactive wastes containing mercury and particularly to wastes containing radioactive mercury isotopes. Mercury compounds are converted into a solid alloy with mercury and the amalgamating material, which is more easily managed and less mobile than solutions containing radioactive mercury. Amalgamation provides a change in mobility from liquid.

2.2.3 Carbon Adsorption

Carbon Adsorption is a technology used to treat wastewaters containing dissolved organics at concentrations less than about 5 percent and some dissolved metal and other inorganic containments. The two most common carbon adsorption processes are the granular activated carbon (GAC), which is used in packed beds, and the powdered activated carbon (PAC), which is added loosely to wastewater.

2.2.4 Chemical Oxidation

Chemical or electrolytic oxidation uses these oxidizing agents either alone or in combination to destroy organic constituents of concern: (1) hypochlorite (e.g., bleach); (2) chlorine; (3) chlorine dioxide; (4) ozone or ultraviolet light (UV) assisted ozone; (5) peroxides; (6) persulfates; (7) perchlorates; (8) permanganates; and/or (9) other oxidizing agents of equivalent efficiency. Chemical oxidation specifically includes what is commonly referred to as alkaline chlorination.

2.2.5 Chemical Reduction

Chemical reduction is a process using these reducing agents either alone or in combination: (1) sulfur dioxide and (2) sodium, potassium, or alkali salts of sulfites, bisulfites, metabisulfates, and polyethylene glycols. Chemical reduction is commonly used for the reduction of hexavalent chromium to the trivalent state.

2.2.6 Filtration

Filtration is removal/separation of particles from a mixture of fluid and particles by a medium that permits the flow of the fluid, but retains the particles. Usually, the larger the particles, the easier they are to remove from the fluid.

2.2.7 Immobilization

Immobilization is treatment of waste through macroencapsulation, microencapsulation, or sealing to reduce surface exposure to potential leaching media or to reduce the leachability of the hazardous constituents.

2.2.8 Incineration

Incineration is a controlled process by which combustible solid, liquid, or gaseous wastes are changed into noncombustible gases and solid ash.

2.2.9 Ion Exchange

Ion Exchange uses a resin to replace certain specific ions in a solution with other ions that are innocuous. Ion Exchange is used to separate a mixed waste into its radioactive and hazardous constituents if the radioactive components are ionic. It will also concentrate the radioactive ionic species into a small volume, leaving a nonradioactive aqueous phase. The principal mixed waste application of this process is to recover metallic radionuclide from wastewaters or acid leach liquids.

2.2.10 Macroencapsulation

Macroencapsulation is immobilization by application of surface coating materials such as polymeric organics (e.g., resins and plastics) or a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media.

2.2.11 Metals Recovery

Recovery of metals or inorganics employs one or more of these direct physical/removal technologies: (1) ion exchange; (2) resin or solid (i.e., zeolites) adsorption; (3) reverse osmosis; (4) chelation/solvent extraction; (5) freeze crystallization; (6) ultrafiltration and/or (7) simple precipitation (i.e., crystallization). Note: This does not preclude the use of other physical phase separation or concentration techniques such as decantation, filtration (including ultrafiltration), and centrifugation, when used in conjunction with the above listed recovery technologies. Metallic compounds are separated from aqueous streams.

2.2.12 Microencapsulation

Microencapsulation is immobilization of debris with these materials such that the leachability of the hazardous contaminants is reduced: (1) Portland cement; or (2) Lime/pozzolans (e.g., fly ash and cement kiln dust. Additives (e.g., iron salts, silicates, and clay) enhance the set/cure time and/or compressive strength, or to reduce the leachability of the hazardous constituents.

2.2.13 Decontamination of Lead

Lead waste, which is unmixed with plastic, paper, or leather, is decontaminated by immersion in an acid bath. The acid dissolves the surface of the lead, which has been contaminated with radionuclides. The decontaminated lead can then be washed and reused. The acid solution is neutralized and the dissolved lead precipitated. The precipitate is removed and stabilized for disposal. The neutralized solution can be further treated for reuse or recycle.

2.2.14 Neutralization

Neutralization uses these chemicals either alone or in combination: (1) acids; (2) bases; or (3) water (including wastewaters) resulting in a pH greater than 2 but less than 12.5 as measured in the aqueous residuals.

2.2.15 Precipitation

Precipitation removes metals and other inorganics by forming insoluble compounds of oxides, hydrides, carbonates, sulfides, sulfates, chlorides, fluorides, or phosphates. These precipitants are typically used alone or in combination: (1) Lime (i.e., containing oxides and/or hydroxides of calcium and/or magnesium); (2) caustic (i.e., sodium and/or potassium hydroxides); (3) soda ash (i.e., sodium carbonate); (4) sodium sulfide; (5) ferric sulfate or ferric chloride; (6) alum; or (7) sodium sulfate. Additional chemicals for flocculating and coagulating precipitates enhance sludge dewatering may also be used.

2.2.16 Pretreatment Process

Processes (e.g., shredding, grinding, physical separation, etc.) that make the waste amenable to the treatment process that ultimately destroys, removes, or immobilizes the hazardous contaminants or characteristics.

2.2.17 Process Wastewater Treatment

All wastewater generated at the HW/MW Low Hazard Building would be treated and reused. There are nine steps in the wastewater treatment process: collection in equalization tank, lime/pH adjustment, flocculent addition, parallel plate clarifier, filter press, final pH adjustment, sand filtration, carbon absorption, and evaporation.

2.2.18 Roasting/Retorting

Sprengle pumps and mercury diffusion pumps contaminated with tritium and mercury are contained in stainless steel boxes. Due to radiation or exposure concerns, some of the boxes are enclosed in a concrete culvert. Processing requires monitoring and opening the culvert and boxes then removing and cutting up the pumps in a glove box prior to roasting and retorting.

Roasting and retorting mercury from radioactive contaminated process equipment has two major components:

Mercury Oven (Roaster)

The mercury oven is electrically heated to approximately 400-degree Celsius with a mechanical vacuum pump providing the required vacuum or negative pressure. The oven is sized to handle 8-liter sprengle pumps and mercury diffusion pumps. The estimated chamber size is 36 x 36 x 36 inches resulting in a capacity of 27 ft³ or 0.76 m³.

Condenser/Decanter (Retort)

The condenser is connected to the offgas system from the oven to condense the mercury vapor and vaporized organic compounds. The mercury is drawn off the bottom of the condenser receiver and condensed. Liquid organics are decanted at the supernatant interface and go to the CIF. The mercury goes to amalgamation. The gas coming out of the condenser is exhausted through the offgas system.

2.2.19 Soil Washing

Soil contaminated with listed, or characteristic wastes is first sifted to remove over-size material. The large pieces are milled to manageable size and mixed with the finer materials. The soil is then mixed with water, which contains additives to adjust the pH and remove other constituents of concern. The washed soil requires no additional stabilization or treatment, but still requires disposal in a RCRA landfill, or a HW/MW landfill, if it contains low level radionuclides. The wash water must be further treated by an effluent treatment facility, before it is released.

2.2.20 Stabilization

Stabilization comprises treatment processes that immobilize hazardous constituents in a waste. For treatment of metals in low-level mixed wastes stabilization technologies will reduce the leachability of the hazardous metal constituents (regardless of whether the metals are radioactive) in nonwastewater matrices.

2.2.21 Steam Stripping

Steam stripping removes volatile organic compounds by heating the contaminated waste directly with high temperature steam. The contaminated waste is usually liquid, but could be a solid. Organics are concentrated in the steam, from which they can be recovered or incinerated.

2.2.22 Thermal Treatment

Thermal treatment involves processing hazardous waste in a device that uses elevated temperatures as the primary means to change the chemical, physical, or biological characteristics or composition of the hazardous waste. Examples of thermal treatment processes are incineration, pyrolysis, calcination, wet air oxidation, and microwave.

2.2.23 Vitrification

A waste treatment process in which waste is mixed with glass and fused into a solid mass. The resultant mass is expected to remain a stable and insoluble form for long time periods. (Vitrification with borosilicate glass is the BDAT for HLW and certain mixed waste streams.)

2.3 Planned/Proposed Facilities

This section contains descriptions of planned or proposed facilities considered in the options analysis.

2.3.1 Containment Building

In the August 18, 1992 *Federal Register* (57 FR 37194), EPA promulgated standards for a new hazardous waste management unit: a "containment building." 40 CFR 264 Subpart DD, §264.1101 and the analogous sections of Part 265 describe design and operating criteria. Design features of a containment building include:

- Walls, floor, and roof to prevent exposure to the elements

- Primary barrier, such as the floor or a process area, or process tankage, that is resistant to the hazardous materials contained
- Secondary containment system, beyond the primary barrier, for hazardous liquid materials (the containment building itself can act as the secondary containment to tanks inside)
- Leak detection system between two barriers
- Liquid collection and removal systems

The design of the containment building submitted with the permit application must be certified by a registered professional engineer.

The owner or operator of the containment building must:

- Ensure that the containment building is maintained free of cracks, corrosion, or other defects that could allow hazardous materials to escape
- Control the inventory of hazardous material within the containment walls so that "the height of any containment wall is not exceeded"
- Provided a decontamination area for personnel and equipment to prevent spreading hazardous materials outside the containment building.
- Control fugitive emissions

The owner or operator must promptly repair any condition that may have resulted in a release of a hazardous waste. The owner or operator also is tasked with monitoring, inspection, recordkeeping, and reporting requirements.

The August 18, 1992 *Federal Register* (57 FR 37194) also amended §262.34, which specifies the requirements governing accumulation of hazardous waste, to allow generators to hold hazardous waste onsite in a containment building for 90 days or less without a permit or interim status. According to *RCRA Regulations and Keyword Index 1993 Edition* (McCoy and Associates, Inc.):

A generator accumulating waste in a containment building for less than 90 days in compliance with §262.34 and Part 265, Subpart DD... may treat these hazardous wastes in a containment building without obtaining a permit or interim status as long as thermal treatment is not involved.

2.3.2 Hazardous Waste/Mixed Waste Treatment Building (HW/MW-TB)

The HW/MW-TB would provide a RCRA permitted facility for the treatment of hazardous and mixed wastes in accordance with Land Disposal Restrictions (LDR) which cannot be treated in other existing or planned facilities at SRS. The HW/MW-TB would also provide a hazardous and mixed waste facility in which the waste is processed into environmentally stable waste forms for disposal. The HW/MW-TB would also repackage some waste streams for shipment to other treatment facilities such as the Consolidation Incineration Facility. Some waste streams would be size or volume reduced in the HW/MW-TB to increase treatment and/or disposal efficiency.

It should be noted that although this facility was considered as a treatment facility in the options analysis, it was not chosen as a preferred option for any waste stream.

Currently the HW/MW-TB processes are likely to be constructed or installed in existing site structures under containment building regulations. The HW/MW-TB project has been placed on hold pending the outcome of the Site Treatment Plan.

2.4 Evolving Technologies

The SRS "Vendor Information Exchange Forum" resulted in the submission of hundreds of proposals for mixed waste treatment options. Engineering assessment of the proposals identified viable treatment options, which then underwent in-depth options analysis (IDOA) to determine their applicability to waste streams onsite. The results of these IDOAs appear in Section 3.0 of Appendix A of the DSTP.

Other agencies have also conducted surveys to find vendors with some potential capability, or at least an expressed desire, to treat DOE mixed waste. These reports have been assessed and new information germane to SRS summarized in Table 4.

None of the vendors listed in Table 4 has mixed waste treatment technology sufficiently well developed to warrant IDOA at this time. All would be eliminated from further consideration as viable options by:

- Low Technology Success Factor (see Section 1.2) due to process immaturity,
- Need for extensive research to determine applicability to mixed waste
- Inappropriateness for SRS waste streams (e.g., designed to treat large volumes of waste water).

Exclusion of these vendors and their unproved technologies from consideration in the DSTP now does not mean that they are without merit. As the technologies mature, they may well offer waste treatment alternatives that are superior to the proven methods necessarily recommended by DSTP.

Table 4
Potentially Meritorious Treatment Technologies
abstracted from literature

Information Sources Used:

- 1 DOE Offsite Fact Sheet
- 2 DOE Technology Connection Program
- 3 EG&G *Review of Private Sector Treatment, Storage, and Disposal Capacity for Radioactive Waste Report*
- 4 Sandia Laboratories *Survey of Mixed Waste Treatment Technologies for Mobile Treatment*

Vendor	Waste	Treatment Technology	Info. Source	Comments
Advanced Recovery Systems, Inc.	Mercury contamination	Mercury removal	3	Pilot scale process.
Alternative Remedial Technologies, Inc.	Contaminated soil	Soil washing	4	Pilot scale process.
Analytical Development Corp.	Wastewater with TRU and heavy metals	Precipitation and clarification	2	Pretreatment. Sludge produced requires stabilization by some other method.
Andco	Wastewater with metals	Electrolysis	2	Main use is treatment of contaminated groundwater.
Atomic Energy of Canada, Inc.	Heavy metal and uranium contaminated solvents	Unspecified	4	Pilot scale process.
Atomic Energy of Canada, Inc.	Organic and aqueous mixed waste solutions	Resin adsorption and stabilization	4	Pilot scale process.
Eichrom Industries, Inc.	Actinides in acidic solution	Resin adsorption	4	Pilot scale process for mixed waste treatment.

Table 4 (contd)

Vendor	Waste	Treatment Technology	Info. Source	Comments
Envirocare of Utah, Inc.	Solid mixed wastes	Stabilization	1	Disposal facility.
Environmental Engineering and Technology	Solid mixed waste	Microwave vitrification	2	Demonstration phase of development
EPOC Water, Inc.	Aqueous suspensions	Microfiltration	4	Water recovery technology. Solids remain in low concentration.
Filter Flow Technology, Inc.	Secondary wastewater from soil washing	Filtration	2	Demonstration process for DOE wastes. Post-treatment for soil washing.
H2O Inc.	Wastewater with metals or VOC	Ozonation	2	Bench scale process.
Hnat	Liquids and solids	Vitrification	4	Pilot scale process.
Hydro-Tek, Inc.	Organic contaminated soil	Roast and retort	4	Does not address radioactive contaminant.
Isotron Corp.	Soil contaminated with metals	Metal migration	2	Bench scale process. Metal migration technology in a containment building was evaluated and rejected (q.v.).
Memtek Corp.	Secondary wastewater from soil washing	Filtration	2	Post-treatment for soil washing.
Molten Metal Technology, Inc.	Waste contaminated with metals, or waste metals	Reduction furnace	2	No radioactive waste experience.
Resource Conservation Co.	Organic contaminated soil and sludge	Solvent extraction	2	Pilot scale process for organic decontamination.
Rockwell International Corp. Rocketdyne Div.	Organic mixed wastes	Molten salt incineration	4	Pilot scale process.
Rust Remedial Services	Contaminated soil	Metal migration	2	Metal migration technology in a containment building was evaluated and rejected.
Rust Remedial Services	Wastewater	Adsorption and magnetic separation	2	Pilot scale process.
Technology Innovation Development Engineering, Inc.	Contaminated finely divided solids	Cement/ flyash encapsulation	2	Bench scale process.

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3.0 SRS WASTE STREAM OPTIONS ANALYSIS

This section contains the Options Analysis for the 60 SRS waste streams. The section is arranged numerically by waste stream (i.e., SR-W001 through SR-W060).

For each waste stream, information is provided that:

- *Describes the waste stream*
- *Summarizes the Options Analysis Process*
- *Justifies option selection or rejection*

3.1 User's Guide Appendix A

Section 3.0 compiles the results of analyses used to assess a wide variety of treatment options and select the one preferred. The information on the waste streams and assessment of treatment options is recorded using two basic formats:

- A **short form** for waste streams for which a preferred option was easily identified without an in-depth analysis because:
 - The waste is part of the design basis of a treatment facility (e.g., CIF)
 - The waste is being treated, or could be treated in an existing facility
 - The waste treatment is controlled by the TRU Waste Management Plan
 - The waste was combined with another waste stream
 - The waste was recharacterized
- A **long form** for waste streams requiring an in-depth analysis to capture all the option assessment documentation.

Both formats begin with the waste stream name and an identifying number assigned by SRS.

Both formats next have **Background Information**.

- A description of the waste and its origins.
- Volume – both the amount of waste currently in storage and the projected future generation.
- Waste stream composition – the physical form of the waste.
- Waste code – the Resource Conservation and Recovery Act (RCRA) identifier.
- Land Disposal Restrictions (LDR) Treatment Standards – RCRA regulatory requirement for treatment of the hazardous constituent (identified by the Waste Code). Treatment standard is either "concentration based" (the concentration of the hazardous constituent in the leachate generated by a Toxicity Characteristic Leaching Procedure (TCLP) performed on a sample of the treated waste) or a "specified technology" (specified by EPA) to treat the waste.
- Waste Characterization – a description of the waste and the way information about the waste was acquired.
 - Basis: process knowledge or sampling and analysis
 - Confidence level with which the waste characterization information is regarded:
 - High: information based on extensive sampling and analysis, or process specification and mass balance calculations; extensive documentation available for review.

- Medium: information based on analyses of samples that may not be representative of the entire waste volume, or test methods that have an inherently wide range of error. Available documentation is less extensive than that needed for high confidence.
- Low: no sampling and analysis, or tests yield uncertain data due to chemical or radiological interferences. Little or no documentation about the waste. (Few waste streams at SRS have a low confidence level. Those that do are addressed very conservatively.)
- Waste concentration data (if available)
- Radiological Characterization:
 - How the waste must be handled (contact or remote)
 - Type of waste (mixed low level, mixed transuranic, high level waste)
 - Activity level (if available)
 - Isotopes (if available)

The *short form* then lists:

- **Preferred Option:** a statement of the technology chosen to treat the waste.
- **Treatment Justification:** a detailed description of the decision-making process and reasoning that resulted in the choice of the preferred option.
- **Cost Estimate Sheet:**
The cost estimate sheet is a form prescribed by DOE Headquarters in "DSTP Cost Guidance Revision 1." It breaks the costs into 8 main elements and numerous sub-elements. The term "WBS Element," which refers to "work breakdown structure," and the method of numbering the elements is based on DOE Order 4700.1 "Project Management System." "Escalation" is the factor provided by DOE that reflects the growth in the cost of a project due to inflation.

The *long form* follows **Background Information** with:

- **Initial Screening:**

The "Rejected Options" table lists treatment methods initially eliminated and the reasons for rejection. This table documents the first culling of treatment methods from a wide range of options.

The options that passed the initial screening and underwent further analysis are listed in the "Feasible Options" table. This table identifies the preferred option and lists the Technology Success Factor (TSF), In-Depth Options Analysis (IDOA) score, and the preliminary planning life cycle cost estimate.
- **Options Rejected Due To Low Technology Success Factor:**

This part gives the reasons that some feasible options scored low on TSF, and were eliminated from further consideration.

- **Engineering Assessment:**

This part documents:

- Reasons the preferred option was selected – Preferred Option Justification
- Any treatability studies needed to confirm the technical viability of the preferred option – Treatability Study Requirements. Not every preferred option requires treatability studies, so this part does not always appear.
- Reasons other options were not selected – Options Rejected During IDOA

- **Treatment Cycle Flow Diagram:**

- Each option (except treatment at DOE offsite facilities) that underwent an in-depth analysis has been represented with a block diagram that traces the waste through each step of the treatment process and identifies principal secondary waste streams. (For DOE offsite facilities a technology description replaced the flow sheet.)

- **Pros and Cons:**

Pros and cons identify the best and worst features of the treatment option depicted in the flow diagram.

- **In-Depth Analysis Score Sheet:**

Each feasible option that had a TSF score greater than 50 underwent in-depth analysis in a highly formalized way. Part of the assessment assigned numerical scores to various attributes of the treatment methods. (See Section 1.2.) Numerical results of the assessment and the reasons for assigning those numbers are recorded on the score sheet.

- **Cost Estimate Sheet:**

The Cost Estimate Sheet in the *long form* is the same as the one in the *short form*.

Waste Stream No.	Waste Stream Name	Volume II Section Identification	Appendix A Page No.
SR-W001	Rad-Contaminated Solvents	3.1I.1	39
SR-W002	Rad-Contaminated Chlorofluorocarbons	3.1I.2	43
SR-W003	Solvent Contaminated Debris (LLW)	3.1H.1	45
SR-W004	M-Area Plating Line Sludge from Supernate Treatment	3.1F.1	49
SR-W005	Mark 15 Filter Cake	3.1F.2	53
SR-W006	Mixed TTA/Xylene	4.1B.1	57
SR-W007	SRL (SRTC) Low Activity Waste	3.1A.1	59
SR-W008	SRL (SRTC) High Activity Waste	3.1A.2	63
SR-W009	Silver Coated Packing Material	3.2B.1	67
SR-W010	Scintillation Solution	3.1I.3	89
SR-W011	Cadmium Coated HEPA Filters	3.1E.5	93
SR-W012	Toxic Cleanup Material	3.1H.2	121
SR-W013A	Low-Level Waste Lead (Uncombined Elemental Lead)	3.1C.1	125
SR-W013B	Low-Level Waste Lead (Combined Lead)	3.1C.2	141
SR-W014	Tritiated Mercury	3.1G.2	163
SR-W015	Mercury Contaminated Equipment	3.1E.3	179
SR-W016	221-F Canyon High Level Liquid Waste (HLW)	5.1A	193
SR-W017	221-H Canyon High Level Liquid Waste (HLW)	5.1A.2	197
SR-W018	Filter Paper Take Up Rolls	3.1H.3	199

Waste Stream No.	Waste Stream Name	Volume II Section Identification	Appendix A Page No.
SR-W019	244-H RBOF High Activity Liquid Waste	2.2.2	223
SR-W020	In-Tank Precipitation (ITP) Filters	3.1E.1	225
SR-W021	Poisoned Catalyst Material	2.2.2	229
SR-W022	Defense Waste Processing Facility(DWPF) Benzene	3.1I.4	231
SR-W023	Safety/Control Rods	3.1E.2	235
SR-W024	Gold Traps	3.1G.1	239
SR-W025	Solvent Waste <100 nCi/g TRU	3.3A.1	243
SR-W026	Thirds TRU Waste	4.1A.1	245
SR-W027	Solvent TRU Waste	4.1A.2	247
SR-W028	Mark 15 Filter Paper – F006	3.1H.4	249
SR-W029	M-Area Sludge Treatability Samples	3.1B.1	269
SR-W030	Spent Methanol Solution	3.1I.5	271
SR-W031	Uranium/Chromium Solution	3.1A.6	275
SR-W032	Mercury Contaminated Heavy Water	3.1A.3	299
SR-W033	Thirds Waste <100 nCi/g TRU Rad	3.3A.2	301
SR-W034	Calcium Metal	3.1K.1	303
SR-W035	Freon 11/Oil Mixture	3.1I.6	321
SR-W036	Radioactive Oil	3.2A.1	323
SR-W037	M-Area High Nickel Plating Line Sludge	3.1F.3	325
SR-W038	Plating Line Sump Material	3.1F.4	329
SR-W039	Nickel Plating Line Solution	3.1A.4	333
SR-W040	M-Area Stabilized Sludge	2.2.2	337
SR-W041A	Aqueous Mercury and Lead	3.1A.7	339
SR-W041B	Aqueous Mercury and Lead (Elemental Liquid Mercury)	3.1G.3	361
SR-W041C	Aqueous Mercury and Lead (Mercury Contaminated Recorder)	3.1E.4	375
SR-W042	Paints and Thinners	3.1J.1	381
SR-W043	Lab Waste w/Tetraphenyl Borate	3.1H.5	393
SR-W044	Tributyl Phosphate & N-paraffin – TRU	4.0	405
SR-W045	Tributyl Phosphate & N-Paraffin	2.2.2	407
SR-W046	Consolidated Incinerator (CIF) Ash	3.1F.5	417
SR-W047	Consolidated Incinerator (CIF) Blowdown	3.1A.5	419
SR-W048	Waste Sites/Spill Site Soil	3.1L.1	435
SR-W049	Tank E-3-1 Clean Out Material	3.1F.6	469
SR-W050	Mixed Waste to Support HL Waste Processing Demonstrations	5.1C.1	481
SR-W051	Spent Filter Cartridges	3.1D.1	483
SR-W052	Cadmium Contaminated Glovebox Section	2.2.2	503
SR-W053	Rocky Flats Incinerator Ash	4.2A.1	505
SR-W054	Enriched Uranium Contaminated with Lead	2.2.2	513
SR-W055	Job Waste Containing Solvent Contaminated Wipes	3.1H.6	515
SR-W056	Job Waste with Enriched Uranium and Solvent Applicators	3.1H.7	533
SR-W057	D-Tested Neutron Generators	2.2.2	545
SR-W058	Mixed Sludge Waste with Mercury-DWPF Treatability Studies	5.1B.1	547
SR-W059	Tetrabutyl Titanate (TBT)	3.1I.8	549
SR-W060	Tritiated Water with Mercury	6.3	561

Summary Page

Waste Stream Number & Name: SR-W001 Rad-Contaminated Solvents

Background Information

This waste stream is radioactively contaminated solvent and solvent mixtures used for cleaning equipment in the Separations or Reactors Areas or used in laboratory procedures. The non-halogenated solvents in storage are wastes that used carbon (C^{14}) and tritium (H^3) labeled materials as tracers, or mixtures of waste scintillation counter calibration standards. The halogenated solvents are degreasing solvents contaminated with tritium. This waste stream was identified in the Interim MWIR (4/93) as Radioactive Trichloroethane.

Volume

- Current volume through 09/30/93 is 0.4 m³.
- Expected 1993-1997 volume will be 2.0 m³.

Waste Stream Composition

- Organic Liquid

Waste Code

- D001A (ignitable high TOC), F001, F002, F003, F005 (halogenated and nonhalogenated spent solvents), D018 (benzene)

LDR Treatment Standard

- D001 = specified technology -- Fuel Substitution, Recovery of Organics, or Incineration
- D018 -- No treatment standard yet developed by EPA
- F001-F003, F005A = concentration based standards -- 0.75 mg/l-170 mg/l except F005A 2-Ethoxyethanol, 2-Nitropropane = Incineration

Waste Characterization

- Process knowledge used to characterize waste stream.
- Confidence level is high based upon the known composition of the solvents used in the processes.

Radiological Characterization

- Sampling and analysis results indicate total activity for tritium as 2.9 nCi/g.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for the Rad-Contaminated Solvents waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Treatment Justification

In-depth options analysis was not performed for this waste stream.

During development of the Consolidated Incineration Facility (CIF) design basis, a determination was made of the types and volumes of hazardous, low level radioactive, and mixed Savannah River Site (SRS) waste streams that would be generated in the future or were in storage for which treatment by incineration would be beneficial. The determination to initiate development of CIF was based on the facts that incineration was recommended or required by environmental regulations and a significant volume or toxicity reduction would be achieved. The waste amenable to incineration were grouped by physical state, solid or liquid, and type of contamination, hazardous and/or radioactive. Some wastes such as Defense Waste Processing Facility benzene and low level radioactive job control waste were individually designated a waste group. The waste groups and current/future volume data were

adopted as a design basis for the CIF Functional Performance Requirements (FPR), OPS-WMP-90-4140. The FPR serves as the baseline design document for the initiation of project development at the SRS.

Based on physical and chemical characteristics, the SRS Mixed wastes already designated for treatment at the CIF fall into one of the CIF design basis waste groups listed as follows:

<u>FPR Waste Group</u>	<u>SRS Mixed Waste Streams</u>
Beta/Gamma Boxed (Solid)	Solvent Contaminated Debris (SR-W003)
	Toxic Clean Up Material (SR-W012)
High BTU (Liquid)	Scintillation Solution (SR-W010)
Chlorinated (Liquid)	Radioactive Contaminated Solvents (SR-W001)
	Radioactive Contaminated
	Chlorofluorocarbons (SR-W002)
	Freon 11/Oil (SR-W035)
DWPF Organic	DWPF Benzene (SR-W022)
Naval Fuel Organic	Spent Methanol (SR-W030)

Some of the CIF design basis waste groups listed in the table are designated in the FPR as nonradioactive hazardous waste. The radioactive nature of the waste does not impact its combustion characteristics. The operation and efficiency of the CIF combustion and air pollution control systems are not influenced by the presence of radioactivity. A mixed waste that meets the chemical and physical criteria of a design basis nonradioactive waste group can be treated in the CIF as effectively as the nonradioactive waste.

The CIF Mission Need and Design Capacity Review (07/07/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 07/29/93) reevaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to generally reexamine the appropriateness of each FPR design basis waste group and additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to an FPR nonradioactive waste group. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA Land Disposal Restriction requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Alternative Technologies Investigated

Biological Treatment

Biological treatment requires developing bacteria to metabolize particular hazardous chemicals contained in the waste. Specific bacteria would have to be developed for each predominant constituent in this waste. Biological treatment is most often used in cases where concentrations of the hazardous organic are low (ppm). Biological treatment is not very effective for waste streams containing high concentrations of hazardous constituents. Biological treatment of concentrated organic liquids is not used because high concentrations or organics would be toxic to biological activity. Since this technology has not been demonstrated on concentrated organic liquid wastes, it is not considered a viable treatment alternative.

Chemical Oxidation

Chemical oxidation involves the addition of a chemical oxidizing agent, such as ozone, to the waste stream. The organic material in the waste is oxidized to carbon dioxide and water vapor. The offgas would be passed through carbon filters to remove volatile organic vapors generated. This process has not been used for concentrated organic waste streams. Formation of incomplete oxidation by-products would be difficult to prevent. The time required for complete oxidation of the waste could be unacceptably long. Also, this treatment has not been demonstrated or developed for this waste stream. Until such

technology development work is completed on this type of waste, this technology is not considered a viable treatment alternative.

Stabilization

There are a variety of stabilization technologies capable of solidifying this waste stream. However, developing a solidification process to bind, 1,1,1-trichloroethylene and tetrachloroethylene to meet the treatment standards for land disposal is unlikely. Since these materials are not destroyed during this process, they could eventually escape into the environment because organics are very difficult to stabilize in commercially available binders. Also, land disposal of large quantities of hazardous organic compounds, even if they can be made to pass treatment standards, is considered an undesirable waste disposal practice. Stabilization, without any pretreatment, increases the overall waste volume, resulting in a significantly higher disposal cost.

Selected Treatment Technology

Since no acceptable alternative treatment technology for this waste was identified, the selected technology is incineration followed by stabilization of the residuals. Incineration destroys organic constituents, generates a residual which is easily stabilized, and significantly reduces the volume of waste placed in permanent disposal facilities. Incineration is the technology typically used for treatment of this waste type.

Waste Stream Number & Name: SR-W001 Rad-Contaminated Solvents
Facility: CIF Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled

Module Location: SRS

Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 0	
1.2 Demonstration Costs	\$ 0	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 0	
1.3.2 Safety Assurance Documentation (TEC)	\$ 1,227	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 29,400	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ 30,627
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Title III Design Support	\$ 1,208	
2.3 Project Management	\$ 1,649	
2.4 Building Construction (inc. fixed price contractor)	\$ 3,936	
2.5 Equipment (engineered)	\$ 2,449	
2.6 Construction Management	\$ 1,045	
2.7 Dedicated Ops, PCAM	\$ 3,617	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 13,904
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 218.3	
3.2 Annual Utilities	\$ 10	
3.3 Annual Materials	\$ 130.2	
3.4 Annual Maintenance	\$ 77.1	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 435.6	
X NUMBER OF YEARS OF OPERATION	1.0	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 436
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 61,900	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 61,900
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$ 0
6.0 Offsite Treatment (DOE)		\$ 0
7.0 Transportation		\$ 0
8.0 Disposal (Stabilized blowdown & ashcrete 65 drums)		\$ 100
SUB COST FOR MODULE		\$ 106,967
ESCALATION		1.060
TOTAL COST		\$ 113,385

This Cost Estimate sheet includes to go (as of 5/31/94) costs for processing SR-W001, as well as SR-W002, SR-W003, SR-W010, SR-W012, SR-W022, SR-W030, SR-W035 and stabilizing resultant ashcrete and blowdown. These are the CIF base case mixed wastes. However, these wastes comprise less than ten percent of the total CIF design basis feed volume. (Low level waste and hazardous waste will comprise the majority of the CIF feed.) These costs include those for SR-W046, treatment of incinerator ash in the ashcrete system. If above numbers do not appear to add correctly, it is the result of computer rounding.

Summary Page

Waste Stream Number & Name: SR-W002 Rad-Contaminated Chlorofluorocarbons

Background Information

This waste consists of chlorofluorocarbon solvents (Freon 113 and Trichlorotrifluoroethane) and degreasing solvents for depleted uranium fines used to assure unhindered adsorption of water in the tritium process. This waste stream also was identified as Radioactive Freon 113 in the Interim MWIR (4/93).

Volume

- Current volume through 09/30/93 1.0 m³.
- Expected 1993-1997 volume will be 3.0 m³.

Waste Stream Composition

- Organic Liquid

Waste Code

- F001 (spent chlorofluorocarbon solvents), F002 (1,1,2 trichloro1,2,2 trifluoroethane), D019 (carbon tetrachloride), D022 (chloroform)

LDR Treatment Standard

- F-listed = concentration based standard – 5.6-33 mg/kg
- D019 and D022 = no treatment standard yet developed by EPA

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based upon known composition of the solvents used in the processes.

Radiological Characterization

- Sampling and analysis results indicate total activity as 0.3 nCi/g.
- Waste stream is alpha (U²³⁸) and beta/gamma emitter.
- Tritium also is present.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for the Rad-Contaminated Chlorofluorocarbons waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Treatment Justification

In-depth options analysis was not performed for this waste stream.

During development of the Consolidated Incineration Facility (CIF) design basis, a determination was made of the types and volumes of hazardous, low level radioactive, and mixed Savannah River Site (SRS) waste streams that would be generated in the future or were in storage for which treatment by incineration would be beneficial. The determination to initiate development of CIF was based on the facts that incineration was recommended or required by environmental regulations and a significant volume or toxicity reduction would be achieved. The waste amenable to incineration were grouped by physical state, solid or liquid, and type of contamination, hazardous and/or radioactive. Some wastes such as Defense Waste Processing Facility benzene and low level radioactive job control waste were individually designated a waste group. The waste groups and current/future volume data were adopted as a design basis for the CIF Functional Performance Requirements (FPR), OPS-WMP-90-4140. The FPR serves as the baseline design document for the initiation of project development at the SRS.

Based on physical and chemical characteristics, the SRS Mixed wastes already designated for treatment at the CIF fall into one of the CIF design basis waste groups listed as follows:

<u>FPR Waste Group</u>	<u>SRS Mixed Waste Streams</u>
Beta/Gamma Boxed (Solid)	Solvent Contaminated Debris (SR-W003) Toxic Clean Up Material (SR-W012)
High BTU (Liquid)	Scintillation Solution (SR-W010)
Chlorinated (Liquid)	Radioactive Contaminated Solvents (SR-W001) Radioactive Contaminated Chlorofluorocarbons (SR-W002) Freon 11/Oil (SR-W035)
DWPF Organic	DWPF Benzene (SR-W022)
Naval Fuel Organic	Spent Methanol (SR-W030)

Some of the CIF design basis waste groups listed in the table are designated in the FPR as nonradioactive hazardous waste. The radioactive nature of the waste does not impact its combustion characteristics. The operation and efficiency of the CIF combustion and air pollution control systems are not influenced by the presence of radioactivity. A mixed waste that meets the chemical and physical criteria of a design basis nonradioactive waste group can be treated in the CIF as effectively as the nonradioactive waste.

The CIF Mission Need and Design Capacity Review (07/07/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 07/29/93) reevaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to generally reexamine the appropriateness of each FPR design basis waste group and additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to an FPR nonradioactive waste group. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA Land Disposal Restriction requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Alternative Technologies Investigated

Chemical Oxidation

Chemical oxidation involves the addition of a chemical oxidizing agent, such as ozone, to the waste stream. The organic material in the waste is oxidized to carbon dioxide and water vapor. The offgas would be passed through carbon filters to remove any volatile organic vapors generated. This process has not been used to treat concentrated organic waste streams. Formation of incomplete oxidation by-products would be difficult to prevent. The time required for complete oxidation of the waste could be unacceptably long. Also, this treatment has not been demonstrated or developed for this waste stream. Until such technology development work is completed, this technology is not considered a viable treatment alternative for this waste type.

Selected Treatment Technology

Since no acceptable alternative treatment technology for this waste was identified, the selected technology is incineration followed by stabilization of the residuals. Incineration destroys organic constituents, generates a residual which is easily stabilized, and significantly reduces the waste volume requiring permanent disposal. With increased concerns over release of freon to the environment, a treatment technology that destroys freon, instead of stabilizing it for disposal, was considered essential. Incineration, or thermal oxidation, is the technology typically used for treatment of this waste type.

Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE STREAM SR-W001. SEE COST ESTIMATE SHEET FOR SR-W001.

Summary Page

Waste Stream Number & Name: SR-W003 Solvent Contaminated Debris (LLW)

Background Information

Spent solvent contaminated rags and wipes are generated sitewide in the clean up of interior spills and for decontamination. The stream is a collection of similar debris whose LDR treatment standards can be met by incineration followed by stabilization. The waste codes indicate the components which may be present in the waste stream as a whole. Waste codes listed in the waste stream would vary depending on where the waste came from within SRS.

Volume

- Current volume through 09/30/93 is 5.4 m³.
- Expected 1993-1997 volume will be 2.0 m³.

Waste Stream Composition

- Organic Debris

Waste Code

- D004A thru D011A (TCLP Metals), D012 thru D043 (Characteristic Organics), F001 thru F003, F005A (halogenated and nonhalogenated spent solvents)

LDR Treatment Standard

- D004A-D017, F001-F003, F005A – concentration based standards = 0.066-170 mg/kg except F005A 2-Ethoxyethanol, 2-Nitropropane = Incineration
- D018-D043 = no treatment standard yet developed by EPA
- Alternate debris technology may be applied

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based upon known composition of the solvents used in the process generating this waste.

Radiological Characterization

- Beta and gamma emitter, Cs¹³⁷ and Pu²³⁸.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for the Solvent Contaminated Debris (LLW) waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Treatment Justification

In-depth options analysis was not performed for this waste stream.

During development of the Consolidated Incineration Facility (CIF) design basis, a determination was made of the types and volumes of hazardous, low level radioactive, and mixed Savannah River Site (SRS) waste streams that would be generated in the future or were in storage for which treatment by incineration would be beneficial. The determination to initiate development of CIF was based on the facts that incineration was recommended or required by environmental regulations and a significant volume or toxicity reduction would be achieved. The waste amenable to incineration were grouped by physical state, solid or liquid, and type of contamination, hazardous and/or radioactive. Some wastes such as Defense Waste Processing Facility benzene and low level radioactive job control waste were individually designated a waste group. The waste groups and current/future volume data were adopted as a design basis for the CIF Functional Performance Requirements (FPR), OPS-WMP-

90-4140. The FPR serves as the baseline design document for the initiation of project development at the SRS.

Based on physical and chemical characteristics, the SRS Mixed wastes already designated for treatment at the CIF fall into one of the CIF design basis waste groups listed as follows:

<u>FPR Waste Group</u>	<u>SRS Mixed Waste Streams</u>
Beta/Gamma Boxed (Solid)	Solvent Contaminated Debris (SR-W003)
	Toxic Clean Up Material (SR-W012)
High BTU (Liquid)	Scintillation Solution (SR-W010)
Chlorinated (Liquid)	Radioactive Contaminated Solvents (SR-W001)
	Radioactive Contaminated
	Chlorofluorocarbons (SR-W002)
	Freon 11/Oil (SR-W035)
DWPF Organic	DWPF Benzene (SR-W022)
Naval Fuel Organic	Spent Methanol (SR-W030)

Some of the CIF design basis waste groups listed in the table are designated in the FPR as nonradioactive hazardous waste. The radioactive nature of the waste does not impact its combustion characteristics. The operation and efficiency of the CIF combustion and air pollution control systems are not influenced by the presence of radioactivity. A mixed waste that meets the chemical and physical criteria of a design basis nonradioactive waste group can be treated in the CIF as effectively as the nonradioactive waste.

The CIF Mission Need and Design Capacity Review (07/07/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 07/29/93) reevaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to generally reexamine the appropriateness of each FPR design basis waste group and additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to an FPR nonradioactive waste group. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA Land Disposal Restriction requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Alternative Technologies Investigated

Acid Digestion

An emerging technology for treatment of mixed Job Control Wastes (JCW) is Catalyzed Nitric Acid Oxidation which is being developed by the Savannah River Technology Center. In this developmental process, the solids are processed in a nitric acid bath with a metal catalyst for oxidation of the organics and dissolution of the solids. Preliminary testing indicates that the process successfully dissolves cellulose and neoprene, but is unsuccessful in dissolving polyethylene and polyvinyl chloride (PVC). Polyethylene and PVC account for approximately 30% wt of the JCW. The organic constituents are oxidized to carbon dioxide by the acid, and the metal contaminants are brought into solution. The resulting spent acid solution, with dissolved hazardous metals, would be treated in a chemical precipitation process to remove the metals and neutralize the solution prior to disposal through a permitted outfall. This technology is only in the development stage and has several safety and environmental issues requiring resolution.

Thermal Desorption

A possible treatment of this waste is by thermal desorption even though it is not demonstrated for this waste stream. Thermal desorption is typically used for volatilization of organics from soils at lower temperatures than produced by incineration. The desorption unit is equipped with an offgas system containing a carbon bed or organics condensation system to prevent environmental release of volatilized organics. Typical process operating

temperatures (350°F-600°F) are below the autoignition temperature of most JCW. The volatile organics would be volatilized and captured, while the treated solids could be compacted or incinerated before disposal. However, the plastics in the JCW begin to melt and volatilize at approximately 250°F (WSRC-TR-93-293). Therefore, this treatment is not practical for SRS JCW. Also, since these wastes contain hazardous metals, the solids would require further treatment prior to disposal.

Other Alternative Technologies

Several other possible alternative technologies are discussed in the CIF Mission Need and Design Capacity Review. These technologies are either in the developmental stage or have not been demonstrated on organic and metal contaminated cellulose and plastic waste. Chemical oxidation processes will react with the cellulose and plastic and generate large volumes of partially oxidized organics. A demonstrated process to separate the hazardous constituents (organics and metals) from the cellulose and plastics has not been identified.

Selected Treatment Technology

Since no acceptable alternative treatment technology for JCW contaminated with organics and heavy metals was identified, the selected technology is incineration followed by stabilization of the residuals. Incineration destroys organic constituents, generates a residual which is easily stabilized, and significantly reduces the volume of waste requiring a disposal. Incineration is the treatment technology currently used by industry for treatment of this waste type.

**Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE
STREAM SR-W001. SEE COST ESTIMATE SHEET FOR SR-W001.**

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Summary Page

Waste Stream Number & Name: SR-W004 M-Area Plating Line Sludges from Supernate Treatment

Background Information

This waste stream is a sludge generated from the treatment of the supernate through the Dilute Effluent Treatment Facility (DETF) and stored in the Process Waste Interim Treatment/Storage Facility (PWIT/SF) in M-Area.

Volume

- Current volume through 09/30/93 is 356 m³.
- Expected 1993-1997 volume will be 490 m³.

Waste Stream Composition

- Inorganic Sludge/Particulate

Waste Code

- F006 (metal plating line waste, without cyanide), nonwastewater

LDR Treatment Standard

- Concentration based standards – 0.066-5.2 mg/l

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based upon knowledge that the process generates a listed hazardous waste.
- TCLP Leachate Results are Pb <.09 mg/l, Cr <.01 mg/l, Ni <.11 mg/l, Cd <.005 mg/l

Radiological Characterization

- Total activity is 0.015 Ci.
- Alpha emitters include U²³⁴, U²³⁵, U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for M-Area Plating Line Sludge from Supernate Treatment is Vitrification in the M-Area Vendor Treatment Process.

Treatment Justification

In-depth options analysis is not required for this waste stream because a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

The proposed action is to stabilize the M-Area mixed wastes utilizing a thermal vitrification process. The process facility would be constructed and operated by a subcontractor to the Westinghouse Savannah River Company. The vitrification process would result in the lowest volume of stabilized waste for final disposal, provide the most durable final waste form, and could be completed for the lowest cost (including final disposal costs) of all treatment alternatives for wastes needing to be treated in M-Area.

The proposed action was evaluated with respect to the technical ability to meet the Land Disposal Restriction criteria for the final stabilized waste form, and for the overall cost of the treatment activities. The ability to meet the durability requirements, that is, Toxicity Characteristic Leaching Procedure (TCLP) testing requirements, for constituents of concern in the final waste form was a critical consideration. The total life cycle cost, including the cost of treating the waste itself, the cost to treat any effluents generated by the vendor, and the cost to dispose of the final waste form were also considered. In addition, the

environmental impacts, onsite and offsite health effects, and occupational health and safety concerns for this treatment method were evaluated.

Treatability studies were performed on M-Area waste streams to determine the treatment technology most likely to meet the treatment standard required in the land disposal restriction standards. The methods determined to be most effective in meeting the treatment standards involved the isolation of the metal contaminants in a cementitious or a glass matrix. Investigation was made into the alternatives for providing such treatment. Treatment options investigated included:

- onsite treatment by a subcontractor at a temporary facility
- onsite treatment at a permanent facility located in M-Area and operated by SRS
- onsite treatment at a permanent facility located at some central SRS location and operated by SRS
- transport to an offsite location for treatment by a vendor
- taking no action

The no action alternative was rejected because of the LDR-FFCA requirement for treatment of the M-Area waste streams.

Evaluation of the treatment option was made for both a cement based stabilization process and a glass/vitrification process. An initial determination was made that vendor processes were cheaper than construction and operation of a permanent, onsite facility by SRS. Cost studies performed in 1991 showed that onsite treatment in facilities constructed at SRS would cost an estimated 46 million dollars if constructed in M-Area or 75 million if constructed at a central SRS location. The estimated cost for a vendor operated cementitious waste stabilization treatment process would be 28 million dollars. A request for bids was made to vendors utilizing both cement and glass isolation processes. A stipulation was made in the bid that the vendor must demonstrate that this process was capable of meeting the land disposal restriction treatment standards for the treated waste streams.

The award of a contract for the treatment of M-Area waste was based on demonstration on the part of the bidder of not only a technically valid treatment process but previous treatment experience and adequate company resources to carry out the work.

Review of the bids received disclosed that the proposal for treating M-Area Wastes by vitrification in a temporary facility operated at SRS by a vendor was the lowest cost alternative. This alternative would also result in the least amount of liquid requiring treatment and discharge at the M-Area wastewater treatment facility and produce the lowest volume of treated waste meeting land disposal restriction standards that would require eventual disposal in a RCRA disposal facility.

When blending and treatment of the Intermediate Treatment/Storage Facility sludge is begun, it is projected that approximately 700,000 gallons of F006 listed mixed waste will be in storage in the tanks. This includes an estimated 50,000 gallons of supernate which cannot be separated from the sludge. Waste streams stored in the tanks include M-Area Plating Line Sludges from Supernate Treatment, SR-W004; M-Area High Nickel Plating Line Sludge, and SR-W037. One waste stream (SR-W054 -- analytical laboratory residue, total volume 35 gallons) has been combined with waste stream SR-W037. SR-W054 is now indistinguishable from form SR-W037 and will be treated identically.

Other M-Area mixed wastes to be treated are stored in 55 gallon drums in the Mixed Waste Storage Shed in M-Area. These wastes include:

- A Watts Plating bath, California list waste solution, SR-W039, Nickel Plating Line Solution
- Mark 15 sludge filter cake, waste stream SR-W005, Mark 15 Filter Cake

- Solid treatability sample residues, waste stream SR-W029, M-Area Sludge Treatability Samples

Two drums of plating line material (SR-W038) are stored in the 645-2N storage facility.

Equipment required for treatment of the M-Area waste would continue to belong to the vendor and, if the equipment could meet Department of Transportation shipping criteria for radioactivity, would be removed from SRS. If equipment could not be successfully decontaminated, it would be disposed onsite. The cost of disposal was a part of the total contract cost.

The M-Area Vendor Treatment Process is capable of effectively treating all of these waste streams to meet regulatory requirement. As a result, upon completion of treatment, all listed and characteristically hazardous waste sludges and liquids from M-Area operations will be eliminated.

Waste Stream Number & Name: SR-W004 **M-Area Plating Line Sludges from Supernate Treatment**
Facility: M-Area Vendor Treatment Process **Treatment Technology** Vitrification
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 35	
1.2 Demonstration Costs	\$ 25	
1.3 Operations Budget Funded Activities	1210	
TOTAL PRE-OPERATIONS		\$ 1270
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$	
2.2 Inspection	\$	
2.3 Project Management	\$	
2.4 Building Construction (inc. indirect)	\$ 750	
2.5 Equipment (inc. indirect)	\$	
2.6 Construction Management	\$	
2.7 Contingency	\$	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 750
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 87.5	
3.2 Annual Utilities	\$ 175	
3.3 Annual Materials	\$	
3.4 Annual Maintenance	\$	
3.5 Annual Contingency	\$	
3.6 Technical Oversight	\$ 125	
TOTAL ANNUAL O & M	\$ 387.5	
X NUMBER OF YEARS OF OPERATION	4	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 1550 (1)
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 1000	
4.2 Closure, Post-Closure, Monitoring	\$	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1000
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 11,200 (2)	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$ 11,200
6.0 Offsite Treatment (DOE)		\$ 0
7.0 Transportation		\$ 52
8.0 Disposal		\$ 2,624
SUB COST FOR MODULE		\$ 18,446
ESCALATION		1.06
TOTAL COST		\$ 19,552

(1) Costs averaged over 4 years, 4QFY94-FY97

(2) Includes closure cost

This Cost Estimate sheet includes costs for processing SR-W004, as well as SR-W005, SR-W029, SR-W037, SR-W038, SR-W039. These costs also include processing SR-W054 which has been combined with waste stream SR-W037.

If above numbers do not appear to add correctly, it is the result of computer rounding.

Summary Page

Waste Stream Number & Name: SR-W005 Mark 15 Filter Cake

Background Information

This waste stream is filter cake from the precipitation and filtration of slightly enriched uranium solution in M-Area. Waste was generated by treatment and precipitation of etching solution from metal plating operations on slightly enriched uranium slugs.

Volume

- Current volume through 09/30/93 is 15.4 m³.
- There will be no future generation of this waste because the manufacturing process which generated this waste is no longer operational.

Waste Stream Composition

- Inorganic Sludge/Particulate

Waste Code

- F006 (metal plating waste sludge, without cyanide), nonwastewater

LDR Treatment Standard

- Concentration based standards – 0.066-5.2 mg/l

Waste Characterization

- Process knowledge and sampling and analysis used to characterize the waste.
- Confidence level is high based upon knowledge that the process generated a listed hazardous waste. Primary components are Ni 6.6% by weight, U 50% by weight (1.1% of the U is U²³⁵).
- No direct TCLP result performed on this waste stream but TCLP performed on a similar waste stream.

Radiological Characterization

- Sampling results indicate total activity is 3.05 Ci.
- Alpha emitters are U²³⁴, U²³⁵, U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for Mark 15 Filter Cake is Vitrification in the M-Area Vendor Treatment Process.

Treatment Justification

In-depth options analysis is not required for this waste stream since a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

The proposed action is to stabilize the M-Area mixed wastes utilizing a thermal vitrification process. The process facility would be constructed and operated by a subcontractor to the Westinghouse Savannah River Company. The vitrification process would result in the lowest volume of stabilized waste for final disposal, provide the most durable final waste form, and could be completed for the lowest cost (including final disposal costs) of all treatment alternatives for wastes needing to be treated in M-Area.

The proposed action was evaluated with respect to the technical ability to meet the Land Disposal Restriction criteria for the final stabilized waste form, and for the overall cost of the treatment activities. The ability to meet the durability requirements, that is, Toxicity Characteristic Leaching Procedure (TCLP) testing requirements, for constituents of concern in the final waste form was a critical consideration. The total life cycle cost, including the

cost of treating the waste itself, the cost to treat any effluents generated by the vendor, and the cost to dispose of the final waste form were also considered. In addition, the environmental impacts, onsite and offsite health effects, and occupational health and safety concerns for this treatment method were evaluated.

Treatability studies were performed on M-Area waste streams to determine the treatment technology most likely to meet the treatment standard required in the land disposal restriction standards. The methods determined to be most effective in meeting the treatment standards involved the isolation of the metal contaminants in a cementitious or a glass matrix. Investigation was made into the alternatives for providing such treatment. Treatment options investigated included:

- onsite treatment by a subcontractor at a temporary facility
- onsite treatment at a permanent facility located in M-Area and operated by SRS
- onsite treatment at a permanent facility located at some central SRS location and operated by SRS
- transport to an offsite location for treatment by a vendor
- taking no action

The no action alternative was rejected because of the LDR-FFCA requirement for treatment of the M-Area waste streams.

Evaluation of the treatment option was made for both a cement based stabilization process and a glass/vitrification process. An initial determination was made that vendor processes were cheaper than construction and operation of a permanent, onsite facility by SRS. Cost studies performed in 1991 showed that onsite treatment in facilities constructed at SRS would cost an estimated 46 million dollars if constructed in M-Area or 75 million if constructed at a central SRS location. The estimated cost for a vendor operated cementitious waste stabilization treatment process would be 28 million dollars. A request for bids was made to vendors utilizing both cement and glass isolation processes. A stipulation was made in the bid that the vendor must demonstrate that this process was capable of meeting the land disposal restriction treatment standards for the treated waste streams.

The award of a contract for the treatment of M-Area waste was based on demonstration on the part of the bidder of not only a technically valid treatment process but previous treatment experience and adequate company resources to carry out the work.

Review of the bids received disclosed that the proposal for treating M-Area Wastes by vitrification in a temporary facility operated at SRS by a vendor was the lowest cost alternative. This alternative would also result in the least amount of liquid requiring treatment and discharge at the M-Area wastewater treatment facility and produce the lowest volume of treated waste meeting land disposal restriction standards that would require eventual disposal in a RCRA disposal facility.

When blending and treatment of the Intermediate Treatment/Storage Facility sludge is begun, it is projected that approximately 700,000 gallons of F006 listed mixed waste will be in storage in the tanks. This includes an estimated 50,000 gallons of supernate which cannot be separated from the sludge. Waste streams stored in the tanks include M-Area Plating Line Sludges from Supernate Treatment, SR-W004; M-Area High Nickel Plating Line Sludge, and SR-W037. One waste stream (SR-W054 – analytical laboratory residue, total volume 35 gallons) has been combined with waste stream SR-W037. SR-W054 is now indistinguishable from form SR-W037 and will be treated identically.

Other M-Area mixed wastes to be treated are stored in 55 gallon drums in the Mixed Waste Storage Shed in M-Area. These wastes include:

- A Watts Plating bath, California list waste solution, SR-W039, Nickel Plating Line Solution

- Mark 15 sludge filter cake, waste stream SR-W005, Mark 15 Filter Cake
- Solid treatability sample residues, waste stream SR-W029, M-Area Sludge Treatability Samples

Two drums of Plating Line Sump Material (SR-W038) are stored in the 645-2N storage facility.

Equipment required for treatment of the M-Area waste would continue to belong to the vendor and, if the equipment could meet Department of Transportation shipping criteria for radioactivity, would be removed from SRS. If equipment could not be successfully decontaminated, it would be disposed onsite. The cost of disposal was a part of the total contract cost.

The M-Area Vendor Treatment Process is capable of effectively treating all of these waste streams to meet regulatory requirement. As a result, upon completion of treatment, all listed and characteristically hazardous waste sludges and liquids from M-Area operations will be eliminated.

Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE STREAM SR-W004. SEE COST ESTIMATE SHEET FOR SR-W004.

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Summary Page

Waste Stream Number & Name: SR-W006 Mixed TTA/Xylene

Background Information

This waste stream is defense-related TRU waste consisting of laboratory waste from plutonium extraction analytical procedures at SRTC. It consists of a homogeneous xylene based liquid chelating agent. TTA stands for Thenoyl Trifluoroacetone.

Volume

- Current volume through 09/30/93 is 0.1 m³.
- There will be no future waste generation because a substitute nonhazardous organic was identified for the lab procedure.

Waste Stream Composition

- Organic Liquid

Waste Code

- D001A (Ignitable high TOC)

LDR Treatment Standard

- Specified Technology = Fuel Substitution, Recovery of Organics, or Incineration

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based upon knowledge of the chemicals used in the analytical procedures.

Radiological Characterization

- Total activity is 100 nCi/g.
- Contains for transuranic contaminants of Pu²³⁹, Am²⁴¹.
- Waste is contact handled.
- Mixed transuranic waste (MTRU)

Preferred Option

The TRU National Program Plan is committed to placing all DOE defense related TRU type wastes (including TRU mixed wastes) into a National Repository currently identified as the Waste Isolation Pilot Plant (WIPP). Option analysis and selection of preferred option for TRU waste treatment are not addressed in this document. SRS has developed a strategy in regard to characterization, preparation to meet the WIPP-WAC, and interim storage of transuranic waste prior to shipment to the WIPP. This strategy is developed in the SRS Transuranic Waste Management Plan.

Treatment Justification

In-depth options analysis is not required for this waste stream. For further information on this waste stream, see the TRU Waste Management Section, Chapter 4 of Volume II.

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Summary Page

Waste Stream Number & Name: SR-W007 SRL (SRTC) Low Activity Waste

Background Information

A waste stream generated by laboratory research, development, and analytical programs at the Savannah River Technology Center (SRTC). The waste comes from laboratories and radiobenches where drains go to the low activity mixed waste storage tanks and have a total activity of less than 1,000 disintegrations per minute per milliliter (d/m/ml).

Volume

- Current volume through 09/30/93 is 71.5 m³.
- Expected volume 1993-1997 will be 375 m³.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D002A (corrosive), D007A (TCLP Cr), D008A (TCLP Pb), D009A (TCLP Hg), D018 (benzene) nonwastewater

LDR Treatment Standard

- D002 = specified technology – Deactivation
- D007A-D009A = concentration based standard = 0.2-5.0 mg/l
- D018 = no treatment standard yet developed by EPA

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high.
- TCLP results include benzene <5 mg/l, Cr = 0.55 mg/l, Pb = 0.15 mg/l, Hg = 0.1 mg/l.

Radiological Characterization

- Sampling indicates total activity ≤ 1000 d/m/ml beta/gamma.
- Alpha emitter is <10 nCi/g.
- Waste is contact handled.
- Mixed low-level waste
- Isotopes present include Cs¹³⁷, H³, and U²³⁵.

Preferred Option

The preferred treatment option for SRTC Low Activity Waste is Ion Exchange and Neutralization in the SRTC Low Activity Waste Storage Tanks.

Treatment Justification

In-depth options analysis is not required for this waste stream since a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

Since 1952, slightly acidic, dilute sodium nitrate waste from the laboratories in Building 773-A of the Savannah River Technology Center has been discharged into storage tanks at SRTC prior to transfer to the F-Area tank farm for volume reduction via evaporation. The waste streams were not initially hazardous but analysis in recent years disclosed the potential for the waste streams to contain chromium (III), lead, mercury or benzene contamination at levels sufficient to make the waste streams characteristically hazardous. As a result, it became necessary by 1991 to determine a treatment methodology and apply for an expansion of interim status for the RCRA Part A permit for SRS in order to comply with hazardous waste regulations for the generation and treatment of hazardous waste at the storage tanks.

In the course of investigation to find an appropriate treatment method for these waste streams, SRTC developed separate resins capable of removing metal contaminants or organics. The resins remove the contaminants with enough efficiency to reduce the contaminant concentration below the treatment standards for the metal. Regulatory treatment standards for characteristic metal concentrations are the TCLP limits; however, no treatment standard has been developed at this time for the benzene contaminant.

The regulations recommend Best Demonstrated Available Technology Standards (BDAT) for waste treatment. The BDAT standards are not requirements. The regulations require that the treatment standards be met but do not require that a specific BDAT treatment be used to meet the standards. Because characteristic metals can be accurately sampled and analyzed, treatment standards have been established. As long as the standard is met there is no requirement in regard to treatment by use of the BDAT. Therefore, the use of the ion exchange resins in the Low and High Level Mixed Waste Storage Tanks at SRTC is an appropriate practice because it enables the waste to be treated to the required standard in the regulations. It is also cost effective because it allows treatment to occur in existing facilities with minimal equipment addition.

Waste Stream Number & Name: SR-W007 **SRL (SRTC) Low Activity Waste**
Facility: SRTC Low Activity Waste **Treatment Technology** Ion Exchange
Storage Tanks
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ 0
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor \$5200/tank treated x2	\$ 10.4	
3.2 Annual Utilities	\$ 1.0	
3.3 Annual Materials change resins 1x/5 yrs	\$ 2.0	
3.4 Annual Maintenance change probe 1x/5 yrs	\$ 5.25	
3.5 Annual Contingency	\$ 5.0	
TOTAL ANNUAL O & M	\$ 23.65	
X NUMBER OF YEARS OF OPERATION	5	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 118
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 0
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$ 0
6.0 Offsite Treatment (DOE)		\$ 0
7.0 Transportation		\$ 0
8.0 Disposal		\$ 0
SUB COST FOR TREATMENT		\$ 118
ESCALATION		1.06
TOTAL COST		\$ 125

If above numbers do not appear to add correctly, it is the result of computer rounding.

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Summary Page

Waste Stream Number & Name: SR-W008 SRL (SRTC) High Activity Waste

Background Information

This waste stream is generated by laboratory research, development, and analytical programs at the Savannah River Technology Center. The waste comes from cupsinks in radiologically controlled hoods or gloveboxes and usually has a total activity of more than 1,000 disintegrations per minute per milliliter (d/m/ml).

Volume

- Current volume through 09/30/93 is 77.4 m³.
- Expected 1993-1997 volume will be 375 m³.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D002A (corrosive), D007A (TCLP Cr), D008A (TCLP Pb), D009A (TCLP Hg), D018 (benzene) nonwastewater

LDR Treatment Standard

- D002A = specified technology – Deactivation
- D007A-D009A = concentration based standard = 0.2-5.0 mg/l
- D018 = no treatment standard yet developed by EPA

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high due to availability of TCLP analysis.
- Typical value for mercury is 0.076 mg/l.

Radiological Characterization

- Radioactive isotopes present may include: Pu²³⁹, U²³⁵, Am²⁴¹, Co⁶⁰, Sb¹²⁵, Cs¹³⁷, Eu¹⁵⁴, Eu¹⁵⁵, Cs¹³⁴, H³.
- Mixed low-level waste
- Waste is contact handled.

Preferred Option

The preferred treatment option for the SRTC High Activity Waste is Ion Exchange and Neutralization in the SRTC High Activity Waste Storage Tanks.

Treatment Justification

In-depth options analysis is not required for this waste stream since a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

Since 1952, slightly acidic, dilute sodium nitrate waste from the laboratories in Building 773-A of the Savannah River Technology Center has been discharged into storage tanks at SRTC prior to transfer to the F-Area tank farm for volume reduction via evaporation. The waste streams were not initially hazardous but analysis in recent years disclosed the potential for the waste streams to contain chromium (III), lead, mercury or benzene contamination at levels sufficient to make the waste streams characteristically hazardous. As a result, it became necessary by 1991 to determine a treatment methodology and apply for an expansion of interim status for the RCRA Part A permit for SRS in order to comply with hazardous waste regulations for the generation and treatment of hazardous waste at the storage tanks.

In the course of investigation to find an appropriate treatment method for these waste streams, SRTC developed separate resins capable of removing metal contaminants or organics.

The resins remove the contaminants with enough efficiency to reduce the contaminant concentration below the treatment standards for the metal. Regulatory treatment standards for characteristic metal concentrations are the TCLP limits; however, no treatment standard has been developed at this time for the benzene contaminant.

The regulations recommend Best Demonstrated Available Technology Standards (BDAT) for waste treatment. The BDAT standards are not requirements. The regulations require that the treatment standards be met but do not require that a specific BDAT treatment be used to meet the standards. Because characteristic metals can be accurately sampled and analyzed, treatment standards have been established. As long as the standard is met there is no requirement in regard to treatment by use of the BDAT. Therefore, the use of the ion exchange resins in the Low and High Level Mixed Waste Storage Tanks at SRTC is an appropriate practice because it enables the waste to be treated to the required standard in the regulations. It is also cost effective because it allows treatment to occur in existing facilities with minimal equipment addition.

Waste Stream Number & Name: SR-W008 SRL (SRTC) High Activity Waste
Facility: SRTC High Activity Waste Treatment Technology Ion Exchange
Storage Tanks

Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ 0
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor \$5200/tank treated x 2	\$ 10.4	
3.2 Annual Utilities	\$ 1.0	
3.3 Annual Materials \$5000/resin replacement	\$ 2.00	
3.4 Annual Maintenance \$5000/resin replacement	\$ 5.25	
3.5 Annual Contingency	\$ 5	
TOTAL ANNUAL O & M	\$ 23.65	
X NUMBER OF YEARS OF OPERATION	5	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 118
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 0
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$ 0
6.0 Offsite Treatment (DOE)		\$ 0
7.0 Transportation		\$ 0
8.0 Disposal		\$ 0
SUB COST FOR TREATMENT		\$ 118
ESCALATION		1.06
TOTAL COST		\$ 125

If above numbers do not appear to add correctly, it is the result of computer rounding.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material

Background Information

Referred to as silver saddles, this material is ceramic packing material coated with silver nitrate (silver coated berl saddles) that was used in the offgas systems in the F- and H-Canyon dissolver operations to bond radioactive Iodine¹²⁹ and Iodine¹³¹ emissions to the saddles as silver iodide. Spent packing material was changed out from the process when pluggage occurred. Material is too small to meet the 60 mm minimum standard for debris.

Volume

- Current volume through 09/30/93 is 10.2 m³.
- Expected 1993-1997 volume will be 3.1 m³.

Waste Stream Composition

- Uncategorized inorganic particulate

Waste Code

- Nonwastewater D011A (TCLP Ag)

LDR Treatment Standard

- Concentration based standard = 5.0 mg/l

Waste Characterization

- No analysis due to ALARA concerns but silver value calculated.

Radiological Characterization

- Beta/Gamma Emitter
- Volatile Radionuclides Iodine¹²⁹ and Iodine¹³¹ (I¹³¹ is a short lived isotope)
- Typical Rad Levels include
 - I¹²⁹ = 62.2 nCi/g
 - Cs¹³⁷ = 3080 nCi/g
 - U²³⁵, U²³⁶, U²³⁸, Pu²³⁹, Pu²⁴⁰
- Process knowledge used to characterize waste stream.
- Waste is remote handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Ashcrete	Ashcrete does not effectively immobilize the characteristic metal. Resulting waste form would not meet LDR requirements.
CIF	Combustion	CIF does not have the equipment to control I ¹²⁹ .
ETF	Pretreatment	Wastewater treatment has no equipment to treat I ¹²⁹ .
LEFT	Pretreatment	LEFT is not designed to treat I ¹²⁹ .
M-Area	Vitrification	Vitrifier cannot control release of I ¹²⁹ .
Tritium	Macro-encapsulation	Fission products not allowed in this facility (policy) to avoid contamination problems. This stream has Fissile materials mixed in it.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page -- Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W009-1	Cont. Bldg.	S. S. Box	51	53	65	4725	√
SR-W009-2	Vendor/Onsite	Stabilization	81	56	66	12162	
SR-W009-3	Vendor/Onsite	Polymer Encapsulation	88	55	65	11066	
SR-W009-4	HW/MW-TB	S. S. Box	94	52	62	14497	
SR-W009-5	Cont. Bldg.	Metathesis	26	33	45	7047	
SR-W009-6	Vendor	Plasma Arc	1				
SR-W009-7	Vendor	Plasma Hearth	1				

Options Rejected Due To Low Technology Success Factor

Plasma Arc Centrifugal Treatment Performed By Vendor

Plasma arc centrifugal treatment performed by vendor was rejected because:

- Plasma arc centrifugal incineration is currently still in the laboratory with no units in the field. Hence, $P_m=0.9$.
- Control of the process requires sophisticated computerized instrumentation. Hence, $P_c=0.9$.
- It is not expected for this technology to reach a level of reliability suitable for industrial application for 5-10 years.

Plasma Hearth Process Performed By Vendor

Plasma hearth process performed by vendor was rejected because:

- Plasma hearth incineration is currently still in the laboratory. While prototypes may exist, they have no record of continuous reliable operation in industrial settings. Hence, $P_m=0.9$.
- Control of the process requires sophisticated computerized instrumentation. Hence, $P_c=0.9$.
- It is not expected for this technology to reach a level of reliability suitable for industrial application for 5-10 years.

Metathesis Performed In A Containment Building

Metathesis performed in a containment building was rejected because:

- Metathesis (the reaction of elemental silver on the waste with HBr) has been demonstrated only at laboratory scale on nonradioactive simulated waste. Hence, $P_m=0.9$.
- Scale-up from bench scale to field scale would result in many uncertainties. The need to handle the waste remotely adds to the complexity. Hence, $P_c=0.5$.
- It should be noted that an IDOA was conducted on this treatment option only because of a specific request to include it as an option.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for Silver Coated Packing Material is Macroencapsulation in a stainless steel box in one of the existing canyon facilities by means of a treatability variance.

This option treats the constituent of concern silver by isolating it from the environment in a stainless steel box that has been tightly welded shut.

This option is preferred because:

- The containment building (canyon) has the needed equipment to handle the waste, which is also contaminated with radioactive I¹²⁹, remotely.
- It satisfies LDR, provided a treatability variance is granted identifying the waste as "debris," which then allows macroencapsulation.
- No secondary waste is generated.

Options Rejected During IDOA

Note: IDOA scores for all of the (5) viable options were within (4) points. The model alone did not yield a clear preferred option.

Stabilization and Encapsulation by Vendors

Stabilization and encapsulation by vendors was rejected because:

- Process to encapsulate or stabilize is very difficult to do with remote handling.
- Highly radioactive materials must be removed from existing protective containers, which causes safety concerns.
- Waste volume more than doubles.
- Waste form is not as long-lived as the preferred option.

Macroencapsulation in Stainless Steel Boxes in the HW/MW-TB

Macroencapsulation in stainless steel boxes in the HW/MW-TB was rejected because:

- Containment building option is technologically equal and more cost-effective.

Metathesis in a Containment Building

Metathesis in a containment building was rejected owing to a low Technology Success Factor. Nevertheless, at the request of SRTC personnel, an IDOA was performed.

Metathesis was rejected because:

- Process does not contain or treat I¹²⁹.
- Process exists only at the laboratory scale.
- Additional, time-consuming research may be required to scale the process up to full size.

AIM

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5 of 10

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-1
Facility: Containment Building Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- There is no secondary waste generation.
- All applicable LDR standards are met.
- Can process a wide range of materials with no loss of efficiency due to off design input.
- S. S. containers will meet current DOT shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- All processes involved (including remote handling systems) are existing technology.
- Similar systems have demonstrated availability of >80%.
- Process failure does not produce altered waste form. A failed container does not create a waste that cannot be fixed with existing technology.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container closure.

Cons

- A treatability variance is required since silver coated packing material does not meet definition of debris.
- All waste will require disposal in HW/MW facilities.
- Not a budget item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	100	Add 20 points to the median score of 80 because there is no secondary waste generation.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met, assuming variance is granted.
• flexibility	80	Can process a wide range of materials with no loss of efficiency due to off design input.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet HW/MW Disposal WAC.

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-1
Facility: Containment Building Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved (including remote handling systems) are existing technology.
• availability	80	Similar systems have demonstrated availability of >80%.
• scalability	50	Throughput is set by design and not easily expanded except by adding additional shifts of operation.
• remedial measures	90	Process failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container does not create a waste that cannot be fixed with existing technology.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container closure.
• non-operational worker potential exposure	50	Remote handled equipment would require decommissioning activities due to radioactive iodine.
• operational worker potential exposure	50	Exposure controlled by design. Number of workers is dependent upon throughput.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	20	A treatability variance is required since silver coated packing material does not meet definition of debris.
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "containment rule."
• waste disposal	20	All waste will require disposal in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the waste form is not as permanent as vitrification.
<i>Cost Considerations</i>		
• life cycle cost	89	
• funding availability	20	Not a budget item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	No market because these are standard closure techniques. Subtract 20 points from the median score of 20 because this is existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because no private sector involvement is anticipated.

IDOA Score: Technical 53 Total 65

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-1
Facility: Containment Building Treatment Technology S. S. Box
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☐ contact handled ☒ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 53	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 212	
1.3.2 Safety Assurance Documentation	\$ 53	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 47	
TOTAL PRE-OPERATIONS		\$ 640
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 232	
2.2 Inspection	\$ 57	
2.3 Project Management	\$ 105	
2.4 Building Construction (i.e. indirect)	\$ 500	
2.5 Equipment (inc. indirect)	\$ 555	
2.6 Construction Management	\$ 74	
2.7 Contingency	\$ 550	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2072
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 8	
3.2 Annual Utilities	\$ 0	
3.3 Annual Materials	\$ 5	
3.4 Annual Maintenance	\$ 3	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 15	
X NUMBER OF YEARS OF OPERATION	1.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 15
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 844	
4.2 Closure, Post-Closure, Monitoring	\$ 8	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 852
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 150
SUB COST FOR MACROENCAPSULATION MODULE		\$ 3729
ESCALATION		1.267
TOTAL COST		\$ 4725

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-2
Facility: Vendor/Onsite Treatment Technology Stabilization

Treatment Cycle Flow Diagram:

Pros

- No secondary waste will be generated.
- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form can be easily shipped as-is.
- The waste meets treatment standard and can be disposed of as non-hazardous radioactive waste.
- This is a proven process used both in DOE-complex and the commercial world.
- Similar systems in the commercial nuclear industry experience availability of 80%.
- Mature technology. Vendor will bring onsite and set up with a minimum delay.
- Skid mounted, no D&D, vendor removes upon completion of work. Requires fewer non-operational workers than comparably sized, skid mounted facilities. Experience in similar facilities indicates that little non-routine maintenance is needed.
- Well accepted waste form. Similar processes result in wasteforms that meet stability requirements for radionuclides for class A stable waste.

Cons

- The waste volume will more than double.
- Waste cannot be contact-handled.
- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because the waste volume will more than double.
• secondary waste generation	100	Add 20 points to the median score of 80 because no secondary waste will be generated.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form can be easily shipped as-is.
• final waste form	80	Final waste form will meet HW/MW Disposal WAC.

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-2
Facility: Vendor/Onsite Treatment Technology Stabilization
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because this is a proven process used both in DOE-complex and the commercial world.
• availability	80	Similar systems in the commercial nuclear industry experience availability of 80%.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	20	Failed waste form can be ground up and reprocessed. Waste cannot be contact-handled.
• schedule for treatment of waste	80	Mature technology. Vendor will bring onsite and set up with a minimum delay.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	70	Requires the same number of non-operational workers as comparable skid-mounted units. Most or all initial construction can be done in a vendor shop. Experience in similar facilities indicates that little non-routine maintenance is required. Subtract 10 points from median score of 80 because of uncertainties surrounding D&D efforts.
• operational worker potential exposure	40	Facility requires about the same number of operational workers as comparably sized skid mounted units. Subtract 10 points from median score of 50 because waste must be remote-handled.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Well accepted waste form. Similar processes result in wasteforms that meet stability requirements for radionuclides for class A stable waste.
• ability to obtain a permit	80	Must demonstrate that waste passes Treatment Standards.
• waste disposal	20	Requires disposal in HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	67	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 56 Total 66

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-2
Facility: Vendor/Onsite Treatment Technology Stabilization
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☐ contact handled ☒ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 168	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 672	
1.3.2 Safety Assurance Documentation	\$ 168	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 90	
TOTAL PRE-OPERATIONS		\$ 1372
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 770	
2.2 Inspection	\$ 140	
2.3 Project Management	\$ 230	
2.4 Building Construction (inc. indirect)	\$ 2000	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 245	
2.7 Contingency	\$ 1741	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 5126
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 150	
3.2 Annual Utilities	\$ 6	
3.3 Annual Materials	\$ 90	
3.4 Annual Maintenance	\$ 54	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 300	
X NUMBER OF YEARS OF OPERATION	0.50	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 150
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 2800	
4.2 Closure, Post-Closure, Monitoring	\$ 25	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 2825
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 1500	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 1500
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 500
SUB COST FOR STABILIZATION MODULE		\$ 11474
ESCALATION		1.06
TOTAL COST		\$ 12162

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-3
Facility: Vendor/Onsite Treatment Technology Polymer Encapsulation

Treatment Cycle Flow Diagram:

Pros

- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form meets shipping requirements in the form it exits the treatment process.
- Final waste form meets treatment standards and can be disposed of as non-hazardous radioactive waste.
- This is a proven process, used both in DOE-complex and the commercial world.
- Mature technology. Vendor will bring onsite and set up with a minimum delay.
- Skid mounted, no D&D, vendor removes upon completion of work. Facility requires more non-operational workers than comparably sized, skid mounted facilities.
- No secondary waste generated.

Cons

- The waste volume will more than double.
- Waste cannot be contact-handled.
- The facility requires more operational workers than comparably sized, skid mounted facilities.
- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because the waste volume will more than double.
• secondary waste generation	100	Add 20 points to the median score of 80 because no secondary waste generated.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-3
Facility: Vendor/Onsite Treatment Technology Polymer
In-Depth Options Analysis Score Sheet Encapsulation

Attribute	Score	Discussion/Notes
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.
• final waste form	80	Final waste form will meet HW/MW Disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because this is a proven process, used both in DOE-complex and the commercial world.
• availability	60	Add 10 points to the median score of 50 because system is normally available 50% of the time.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	20	Failed waste form can be ground up and reprocessed. Waste cannot be contact-handled.
• schedule for treatment of waste	80	Mature technology. Vendor will bring onsite and set up with a minimum delay.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	70	Requires the same number of non-operational workers as comparable skid-mounted units. Most or all initial construction can be done in a vendor shop. Experience in similar facilities indicates that little non-routine maintenance is required. Subtract 10 points from median score of 80 because of uncertainties surrounding D&D efforts.
• operational worker potential exposure	20	The facility requires more operational workers than comparably sized, skid mounted facilities. Waste must be handled remotely.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be in compliance without needing a variance.
• ability to obtain a permit	80	Must demonstrate that waste passes Treatment Standards.
• waste disposal	20	Requires HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	70	
• funding availability	20	Not a budgeted item, will require line item funding.

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-3
Facility: Vendor/Onsite Treatment Technology Polymer
In-Depth Options Analysis Score Sheet Encapsulation

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 55 Total 65

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-3
Facility: Vendor/Onsite Treatment Technology Polymer
Cost Estimate Sheet Encapsulation

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☐ contact handled ☒ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 146	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 585	
1.3.2 Safety Assurance Documentation	\$ 146	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 90	
TOTAL PRE-OPERATIONS		\$ 1242
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 660	
2.2 Inspection	\$ 140	
2.3 Project Management	\$ 230	
2.4 Building Construction (inc. indirect)	\$ 2000	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 210	
2.7 Contingency	\$ 1516	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 4756
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 150	
3.2 Annual Utilities	\$ 6	
3.3 Annual Materials	\$ 90	
3.4 Annual Maintenance	\$ 54	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 300	
X NUMBER OF YEARS OF OPERATION	0.50	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 150
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 2400	
4.2 Closure, Post-Closure, Monitoring	\$ 43	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 2443
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 1000	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 1000
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 850
SUB COST FOR POLYMER ENCAPSULATION MODULE		\$ 10440
ESCALATION		1.06
TOTAL COST		\$ 11066

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-4
Facility: HW/MW-TB Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- There is no secondary waste generation.
- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- S. S. containers will meet current DOT shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- This is a proven process, used both in DOE-complex and the commercial world.
- Similar systems in the commercial nuclear industry experience availability of >80%.
- Process failure does not produce altered waste form. A failed container does not create a waste that cannot be fixed with existing technology.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.

Cons

- A treatability variance is required since silver coated packing material does not meet definition of debris.
- Requires HW/MW disposal.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. box.
• secondary waste generation	100	Add 20 points to the median score of 80 because there is no secondary waste generation, assuming variance is granted.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR, assuming variance is granted.
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-4
Facility: HW/MW-TB Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	90	Add 10 points to the median score of 80 because this is a proven process, used both in DOE-complex and the commercial world.
• availability	80	Similar systems in the commercial nuclear industry experience availability of >80%.
• scalability	50	Throughput is set by design, and not easily expanded except by adding additional shifts of operation.
• remedial measures	90	Process failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container does not create a waste that cannot be fixed with existing technology.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	50	Remote handled equipment would require decommissioning activities due to radioactive iodine.
• operational worker potential exposure	40	Exposure is controlled by design and < average number of workers. Subtract 10 points from the median score of 50 because of greater potential for exposure due to radiation levels.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily after treatment.
<i>Regulatory Parameters</i>		
• need for variance	20	A treatability variance is required since silver coated packing material does not meet definition of debris.
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	20	Requires HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to simplicity of the process. Subtract 10 points from the median score of 50 because it does not eliminate the waste from the environment.
<i>Cost Considerations</i>		
• life cycle cost	66	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because this is an existing technology.

IDOA Score: Technical 52 Total 62

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-4
Facility: HW/MW-TB Treatment Technology S. S. Box
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☐ contact handled ☒ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 181	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 725	
1.3.2 Safety Assurance Documentation	\$ 181	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 160	
TOTAL PRE-OPERATIONS		\$ 1522
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 782	
2.2 Inspection	\$ 232	
2.3 Project Management	\$ 392	
2.4 Building Construction (inc. indirect)	\$ 3000	
2.5 Equipment (inc. indirect)	\$ 555	
2.6 Construction Management	\$ 249	
2.7 Contingency	\$ 1880	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 7090
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 8	
3.2 Annual Utilities	\$ 0	
3.3 Annual Materials	\$ 5	
3.4 Annual Maintenance	\$ 3	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 15	
X NUMBER OF YEARS OF OPERATION	1.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 15
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 2844	
4.2 Closure, Post-Closure, Monitoring	\$ 15	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 2859
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 300
SUB COST FOR MACROENCAPSULATION MODULE		\$ 11786
ESCALATION		1.23
TOTAL COST		\$ 14497

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-5
Facility: Containment Building Treatment Technology Metathesis

Treatment Cycle Flow Diagram:

Pros

- LDR standards will be met.
- S. S. containers will meet current DOT shipping requirements.

Cons

- Process is specific to treatment of the waste stream.
- Technology is currently in the R&D phase.
- Uncertainties related to the process make availability predictions difficult.
- Since treatment is in the R & D phase, confidence in developing a schedule is low.
- Remote handled equipment would require decommissioning activities due to radioactive iodine.
- Treatability variance is required due to inability to analyze final waste form.
- Disposal in long-lived isotope facility is required.
- Process is unfamiliar to the Stakeholders.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	50	Waste volume is increased since some unrelated HBr will result.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because LDR standards will be met.
• flexibility	20	Process is specific to treatment of the waste stream.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-5
Facility: Containment Building Treatment Technology Metathesis
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	10	Subtract 10 points from the median score of 20 because technology is currently in the R&D phase.
• availability	20	Uncertainties related to the process make availability predictions difficult.
• scalability	50	Throughput is set by design and not easily expanded.
• remedial measures	40	Subtract 10 points from the median score of 50 because resultant waste will be uncharacterized with high radiation.
• schedule for treatment of waste	20	Since treatment is in the R & D phase, confidence in developing a schedule is low.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	50	Extensive emission control system creates vulnerability to accidents.
• non-operational worker potential exposure	50	Remote handled equipment would require decommissioning activities due to radioactive iodine.
• operational worker potential exposure	50	Exposure controlled by design. Number of workers is dependent upon throughput.
• transportation potential exposure	50	Waste is in S. S. container during shipping. Some additional characterization may be needed.
<i>Regulatory Parameters</i>		
• need for variance	20	Treatability variance is required due to inability to analyze final waste form.
• ability to obtain a permit	50	Uncertainties surround attaining a permit since process is new and in the R & D phase.
• waste disposal	20	Waste will require disposal waste facility that is compatible with I ¹²⁹ .
<i>Public Acceptance</i>		
• public acceptance	20	Process is unfamiliar to the Stakeholders.
<i>Cost Considerations</i>		
• life cycle cost	84	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	50	Reaction of silver with HBr may have application elsewhere.
• private sector involvement	0	Subtract 20 points from the median score of 20 because no private sector companies have experience with this process.

IDOA Score: Technical 33 Total 45

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-5
Facility: Containment Building Treatment Technology Metathesis
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☐ contact handled ☒ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 83	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 330	
1.3.2 Safety Assurance Documentation	\$ 83	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 74	
TOTAL PRE-OPERATIONS		\$ 845
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 364	
2.2 Inspection	\$ 81	
2.3 Project Management	\$ 156	
2.4 Building Construction (inc. indirect)	\$ 500	
2.5 Equipment (inc. indirect)	\$ 1155	
2.6 Construction Management	\$ 116	
2.7 Contingency	\$ 856	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 3228
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 8	
3.2 Annual Utilities	\$ 0	
3.3 Annual Materials	\$ 5	
3.4 Annual Maintenance	\$ 3	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 15	
X NUMBER OF YEARS OF OPERATION	.50	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 8
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 1324	
4.2 Closure, Post-Closure, Monitoring	\$ 8	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1332
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 150
SUB COST FOR METATHESIS MODULE		\$ 5562
ESCALATION		1.267
TOTAL COST		\$ 7047

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W009 Silver Coated Packing Material
Option Number: SR-W009-6
Facility: Vendor Treatment Technology Plasma Arc

Treatment Cycle Flow Diagram:

Option rejected during technical success factor evaluation. No further analysis performed.

Waste Stream Number & Name: SR-W009
Option Number: SR-W009-7
Facility: Vendor

Silver Coated Packing Material
Treatment Technology Plasma Hearth

Treatment Cycle Flow Diagram:

Option rejected during technical success factor evaluation. No further analysis performed.

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Summary Page

Waste Stream Number & Name: SR-W010 Scintillation Solution

Background Information

Organic solution used in bioassay analysis by analytical laboratories at the SRTC.
Nonhazardous substitutes are now being used and this waste is no longer generated.

Volume

- Current volume through 09/30/93 is 3.6 m³.
- No future waste generation expected because a nonhazardous scintillation organic was identified and substituted into the laboratory procedure.

Waste Stream Composition

- Organic Liquid

Waste Code

- D001A (ignitable high TOC), F003 (xylene), F005A (toluene), D018 (benzene) spent solvent, nonwastewater

LDR Treatment Standard

- D001A = specified technology – Fuel Substitution, Recovery of Organics, or Incineration
- F003 and F005A = concentration based standards = 0.75 mg/l-170 mg/l except F005A 2-Ethoxyethanol, 2-Nitropropane = Incineration
- D018 = no treatment standard yet developed by EPA

Waste Characterization

- Process knowledge was used to characterize the waste stream.
- Confidence level is high due to knowledge of the laboratory process and the use of mass balance.

Radiological Characterization

- Tritium and beta/gamma emitters.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for the Scintillation Solution waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Treatment Justification

In-depth options analysis was not performed for this waste stream.

During development of the Consolidated Incineration Facility (CIF) design basis, a determination was made of the types and volumes of hazardous, low level radioactive, and mixed Savannah River Site (SRS) waste streams that would be generated in the future or were in storage for which treatment by incineration would be beneficial. The determination to initiate development of CIF was based on the facts that incineration was recommended or required by environmental regulations and a significant volume or toxicity reduction would be achieved. The waste amenable to incineration were grouped by physical state, solid or liquid, and type of contamination, hazardous and/or radioactive. Some wastes such as Defense Waste Processing Facility benzene and low level radioactive job control waste were individually designated a waste group. The waste groups and current/future volume data were adopted as a design basis for the CIF Functional Performance Requirements (FPR), OPS-WMP-90-4140. The FPR serves as the baseline design document for the initiation of project development at the SRS.

Based on physical and chemical characteristics, the SRS Mixed wastes already designated for treatment at the CIF fall into one of the CIF design basis waste groups listed as follows:

<u>FPR Waste Group</u>	<u>SRS Mixed Waste Streams</u>
Beta/Gamma Boxed (Solid)	Solvent Contaminated Debris (SR-W003) Toxic Clean Up Material (SR-W012) Scintillation Solution (SR-W010) Radioactive Contaminated Solvents (SR-W001) Radioactive Contaminated Chlorofluorocarbons (SR-W002) Freon 11/Oil (SR-W035) DWPF Benzene (SR-W022) Spent Methanol (SR-W030)
High BTU (Liquid)	
Chlorinated (Liquid)	
DWPF Organic	
Naval Fuel Organic	

Some of the CIF design basis waste groups listed in the table are designated in the FPR as nonradioactive hazardous waste. The radioactive nature of the waste does not impact its combustion characteristics. The operation and efficiency of the CIF combustion and air pollution control systems are not influenced by the presence of radioactivity. A mixed waste that meets the chemical and physical criteria of a design basis nonradioactive waste group can be treated in the CIF as effectively as the nonradioactive waste.

The CIF Mission Need and Design Capacity Review (07/07/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 07/29/93) reevaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to generally reexamine the appropriateness of each FPR design basis waste group and additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to an FPR nonradioactive waste group. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA Land Disposal Restriction requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Alternative Technologies Investigated

Biological Treatment

Biological treatment involves developing specific bacteria that destroys particular hazardous chemicals contained in the waste. Biological treatment is not effective for concentrated organic liquid wastes because this technology has not been demonstrated on concentrated organic liquid wastes, it is not considered a viable treatment alternative. Since these wastes contain a large variety of organic species, development of bacteria to handle all the compounds would be very difficult. Biological treatment is most often used in cases where concentrations of the hazardous organics are low (ppm).

Chemical Oxidation

Chemical oxidation involves the addition of a chemical oxidizing agent, such as ozone, to the waste stream. The organic material in the waste is oxidized to carbon filters to remove volatile organic vapors generated. This process has not been used for concentrated organic waste streams. Formation of incomplete oxidation by-products would be difficult to prevent. The time required for complete oxidation of the waste could be unacceptably long. The inclusion of a wider variety of organic compounds in the waste only makes chemical oxidation treatment more difficult. Until this technology is developed and demonstrated for concentrated organic liquids, it is not considered a viable treatment alternative.

Stabilization

There are a variety of stabilization technologies capable of solidifying this waste stream.

The inclusion of a wider variety of organic compounds in the waste only makes stabilization more difficult. Again, land disposal of large quantities of hazardous organic compounds, even if they can be made to pass treatment standards, is considered an undesirable waste disposal practice.

Selected Treatment Technology

Since no acceptable alternative treatment technology for this waste was identified, the selected technology is incineration followed by stabilization of the residuals. Incineration destroys organic constituents, generates a residual which is easily stabilized, and significantly reduces the volume of waste placed in permanent disposal facilities. Incineration is the technology typically used by industry for treatment of this waste type.

**Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE
STREAM SR-W001. SEE COST ESTIMATE SHEET FOR SR-W001.**

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters

Background Information

This waste stream is high efficiency particulate air (HEPA) filters used to filter ventilation air from the reactors. The filter frames are hazardous due to cadmium plating on the metal frames. Replacement units are stainless steel framed filters. Some filter material is glued onto the frames while other waste containers hold the metal frames only (filters removed). Waste is stored in 12 mil plastic within carbon steel B-25 boxes.

Volume

- Current volume through 09/30/93 is 100.2 m³.
- No future waste generation expected because HEPA filters with cadmium coated filter frames are no longer used at this site and all cadmium filters have been removed from service and collected.

Waste Stream Composition

- Cadmium containing metal debris
- Inorganic debris

Waste Code

- D006A (TCLP Cd) Nonwastewater

LDR Treatment Standard

- Concentration based standard – 1.0 mg/l
- Alternate debris technology may be applied

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based on analytical results.
- A typical TCLP shows 154 mg/l Cd

Radiological Characterization

- Tritium – contamination level 10⁻⁸ nCi/g
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Incineration	Incinerator would melt metal frames. It has no provision for handling molten metal.
ETF	Wastewater	ETF has no equipment to remove Cd metal.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W011-1	M-Area	Acid Leach	75	57	70	2298	√
SR-W011-2	HW/MW-TB	S. S. Box	94	58	59	31396	
SR-W011-3	Vendor/Onsite	Stabilization	75	58	67	12631	
SR-W011-4	Vendor/Onsite	Polymer Encapsulation	100	56	65	12970	
SR-W011-5	Cont. Bldg.	S. S. Box	88	58	68	8589	
SR-W011-6	INEL/WEDF	Stabilization	*	51	65	1279	
SR-W011-7	Vendor	Plasma Hearth	1				

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

Plasma Hearth Process Performed by Vendor

Plasma hearth process performed by vendor was rejected because:

- Plasma hearth incineration is currently still under development.
- Prototypes may exist, but they have no record of continuous reliable operation in industrial settings. Hence, $P_m=0.9$.
- Control of the process requires sophisticated computerized instrumentation. Hence, $P_c=0.9$.
- It is not expected for this technology to reach a level of reliability suitable for industrial application for 5-10 years.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for Cadmium Coated HEPA Filters is acid leaching in M-Area followed by Vitrification in the M-Area Vendor Treatment Process.

This option treats the constituent of concern cadmium by stabilizing it in a glass waste form.

This option is preferred because:

- Volume of the constituent of concern will be reduced more than 5 to 1.
- All LDR standards will be met.
- It employs a vendor process for which a contract has already been let for other waste streams.
- Decontaminated frames can be disposed of as scrap.

Options Rejected During IDOA

Macroencapsulation by a Vendor in a Containment Building

Macroencapsulation by a vendor (in polymer, in cement grout and in stainless steel box) in a containment building was rejected because:

- Waste volume more than doubles.
- Waste form is not as long-lived as the selected option.
- Large majority of waste will require HW/MW disposal.

Stabilization at INEL/WEDF

Stabilization at INEL/WEDF (encapsulating the waste with a grout matrix) was rejected because:

- Large volume waste streams are designated to be treated onsite.
- Existing process will have to be expanded to handle this waste.
- Waste volume more than doubles.
- Large majority of waste will require HW/MW disposal.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-1
Facility: M-Area Treatment Technology Acid Leach

Treatment Cycle Flow Diagram:

Pros

- Volume of constituent of concern reduced 5:1.
- Effluent will be in the form of filter cake. Little filter cake will be produced. HEPA filters are returned to original containers.
- All applicable LDR treatment standards are met and if waste is delisted, final waste will be non-hazardous.
- Care must be taken not to include other wastes with frames.
- Final waste form will meet disposal WAC.
- Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load.
- Extra tanks already available. Could run process more shifts.
- Vitrified final waste form can be recycled through the melter. Release of liquid to outfall done only after analysis.
- Few or no emissions even under accident conditions.
- No increase in non-operational worker crew size.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-1
Facility: M-Area Treatment Technology Acid Leach

Pros (contd)

- No increase in operational worker crew size.
- Expect treatment to render a wasteform to compliance with LDR.
- This employs existing vendor process.

Cons

- Not a budgeted item.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	80	Volume of constituent of concern reduced 5:1.
• secondary waste generation	80	Effluent will be in the form of filter cake. Little filter cake will be produced. HEPA filters are returned to original containers.
• destruction removal and demobilization efficiency	80	All applicable LDR treatment standards are met and if waste is delisted (F006), final waste will be non-hazardous.
• flexibility	50	Care must be taken not to include other wastes with frames.
• ability to be shipped	80	Care must be taken not to include other wastes with frames.
• final waste form	80	Final waste form will meet disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	50	Individually demonstrated technology but not yet demonstrated as integrated.
• availability	80	Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load.
• scalability	80	Extra tanks already available. Could run process more shifts.
• remedial measures	80	Vitrified final waste form can be recycled through the melter. Release of liquid to outfall done only after analysis.
• schedule for treatment of waste	50	Expect melter to be in place, but crusher/shredder not currently planned and building to house shredder is currently on schedule to be transferred to ER for D&D status.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few or no emissions even under accident conditions.
• non-operational worker potential exposure	80	No increase in non-operational worker crew size.
• operational worker potential exposure	80	No increase in operational worker crew size.
• transportation potential exposure	50	Nothing unusual about waste form. Expect low alpha and no liquids.
<i>Regulatory Parameters</i>		
• need for variance	80	Expect treatment to render a wasteform to compliance with LDR.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-1
Facility: M-Area Treatment Technology Acid Leach
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• ability to obtain a permit	50	Will require modification to existing wastewater permit. DHEC could require a RCRA Part B permit with change in waste stream.
• waste disposal	50	Some final waste forms may require disposal as HW/MW.
<i>Public Acceptance</i>		
• public acceptance	50	Public approves of treatments that result in a glass waste form.
<i>Cost Considerations</i>		
• life cycle cost	93	
• funding availability	20	Not a budgeted item.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this employs existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this employs existing vendor process.

IDOA Score: Technical 57 Total 70

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-1
Facility: M-Area Treatment Technology Acid Leach
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 12	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 47	
1.3.2 Safety Assurance Documentation	\$ 12	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 1150	
1.3.5 Project Management	\$ 2	
TOTAL PRE-OPERATIONS		\$ 1348
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 55	
2.2 Inspection	\$ 12	
2.3 Project Management	\$ 14	
2.4 Building Construction (inc. indirect)	\$ 50	
2.5 Equipment (inc. indirect)	\$ 200	
2.6 Construction Management	\$ 18	
2.7 Contingency	\$ 123	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 470
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 150	
3.2 Annual Utilities	\$ 6	
3.3 Annual Materials	\$ 90	
3.4 Annual Maintenance	\$ 54	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 300	
X NUMBER OF YEARS OF OPERATION	1.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 300
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 0	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 50
SUB COST FOR ACID LEACH MODULE		\$ 2168
ESCALATION		1.06
TOTAL COST		\$ 2298

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-2
Facility: HW/MW-TB Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- Process satisfies requirements of the "debris rule" and all applicable LDR standards are met.
- Can process a wide range of materials without loss of efficiency due to off design input.
- S. S. containers will meet current DOT shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- All processes involved are existing technology.
- Similar systems have demonstrated availability of >80%.
- Process failure does not produce altered waste form. A failed container is easily fixed.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.
- Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
- Exposure controlled by design. Number of workers is dependent upon throughput.

Cons

- Not a budget item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	50	HEPA filters removed will require disposal by standard technology.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-2
Facility: HW/MW-TB Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• flexibility	80	Can process a wide range of materials without loss of efficiency due to off design input.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved are existing technology.
• availability	80	Similar systems have demonstrated availability of >80%.
• scalability	50	Throughput is set by design and not easily expanded except by adding more shifts of operation.
• remedial measures	90	Add 10 points to the median score of 80 because process failure does not produce altered waste form. A failed container is easily fixed.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	80	Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
• operational worker potential exposure	80	Add 10 points to the median score because exposure controlled by design. Number of workers is dependent upon throughput.
• transportation potential exposure	60	Add 10 points to the median score of 50 because no additional characterization needed. Waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process satisfies requirements of the "debris rule."
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	40	All waste will require disposal in HW/MW facilities. Subtract 10 points from the median score of 50 because HEPA filters can go to LLW disposal. Filter frames require HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the waste form is not unalterably stable.
<i>Cost Considerations</i>		
• life cycle cost	10	
• funding availability	20	Not a budget item, will require line item funding.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-2
Facility: HW/MW-TB Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Industry Involvement		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because this is an existing technology.

IDOA Score: Technical 58 Total 59

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-2
Facility: HW/MW-TB Treatment Technology S. S. Box
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 366	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 1464	
1.3.2 Safety Assurance Documentation	\$ 366	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 315	
TOTAL PRE-OPERATIONS		\$ 2786
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 1573	
2.2 Inspection	\$ 496	
2.3 Project Management	\$ 811	
2.4 Building Construction (inc. indirect)	\$ 7000	
2.5 Equipment (inc. indirect)	\$ 150	
2.6 Construction Management	\$ 501	
2.7 Contingency	\$ 3796	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 14326
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 225	
3.2 Annual Utilities	\$ 9	
3.3 Annual Materials	\$ 135	
3.4 Annual Maintenance	\$ 81	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 450	
X NUMBER OF YEARS OF OPERATION	4.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 1800
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 5720	
4.2 Closure, Post-Closure, Monitoring	\$ 43	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 5763
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 850
SUB COST FOR MACROENCAPSULATION MODULE		\$ 25525
ESCALATION		1.23
TOTAL COST		\$ 31396

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W011
Option Number: SR-W011-3
Facility: Vendor/Onsite

Cadmium Coated HEPA Filters

Treatment Technology Stabilization

Treatment Cycle Flow Diagram:

Pros

- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form can be easily shipped as-is.
- The waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- It is a proven process, used both in DOE-complex and the commercial world.
- Similar systems in the commercial nuclear industry experience availability of 80%.
- Mature technology. Vendor will bring onsite and set up with a minimum delay.
- Process can be installed in a building with adequate emission controls.
- Skid mounted, no D&D, vendor removes upon completion of work. Requires fewer non-operational workers than comparably sized, skid mounted facilities. Experience in similar facilities indicates that little non-routine maintenance is needed.
- Must demonstrate that waste passes Treatment Standards.
- Process will be in full compliance without requiring a variance.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-3
Facility: Vendor/Onsite Treatment Technology Stabilization

Cons

- The waste volume will more than double.
- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because the waste volume will more than double.
• secondary waste generation	50	Containers and HEPA filters removed will require disposal.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form can be easily shipped as-is.
• final waste form	100	Waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because it is a proven process, used both in DOE-complex and the commercial world.
• availability	80	Similar systems in the commercial nuclear industry experience availability of 80%.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form can be over-packed, or ground up and reprocessed.
• schedule for treatment of waste	80	Mature technology. Vendor will bring onsite and set up with a minimum delay.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	80	Skid mounted. Requires fewer non-operational workers than comparably sized, skid mounted facilities. Experience in similar facilities indicates that little non-routine maintenance is needed.
• operational worker potential exposure	50	Facility requires about the same number of operational workers as comparably sized, skid mounted facilities.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be in full compliance without needing a variance.
• ability to obtain a permit	80	Must demonstrate that waste passes Treatment Standards.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-3
Facility: Vendor/Onsite Treatment Technology Stabilization
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• waste disposal	40	Subtract 10 points from the median score of 50 because HEPA filters can go to LLW disposal. Filter frames must have HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	66	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 58 Total 67

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-3
Facility: Vendor/Onsite Treatment Technology Stabilization
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 168	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 672	
1.3.2 Safety Assurance Documentation	\$ 168	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 90	
TOTAL PRE-OPERATIONS		\$ 1372
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 770	
2.2 Inspection	\$ 140	
2.3 Project Management	\$ 230	
2.4 Building Construction (inc. indirect)	\$ 2000	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 245	
2.7 Contingency	\$ 1741	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 5126
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 28	
3.2 Annual Utilities	\$ 1	
3.3 Annual Materials	\$ 17	
3.4 Annual Maintenance	\$ 10	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 56	
X NUMBER OF YEARS OF OPERATION	4.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 225
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 2800	
4.2 Closure, Post-Closure, Monitoring	\$ 43	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 2843
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 1500	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 1500
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 850
SUB COST FOR CEMENT STABILIZATION MODULE		\$ 11916
ESCALATION		1.06
TOTAL COST		\$ 12631

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-4
Facility: Vendor/Onsite Treatment Technology Polymer Encapsulation

Treatment Cycle Flow Diagram:

Pros

- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form meets shipping requirements in the form it exits the treatment process.
- This meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- This is a proven process, used both in DOE-complex and the commercial world.
- Mature technology. Vendor will bring onsite and set up with a minimum delay.
- Process can be installed in a building with adequate emission controls.
- Skid mounted, no D&D, vendor removes upon completion of work. Facility requires more non-operational workers than comparably sized, skid mounted facilities.

Cons

- The waste volume will more than double.
- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because the waste volume will more than double.
• secondary waste generation	50	HEPA filters removed will require by standard technology.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-4
Facility: Vendor/Onsite Treatment Technology Polymer
In-Depth Options Analysis Score Sheet Encapsulation

Attribute	Score	Discussion/Notes
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.
• final waste form	100	This meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because this is a proven process, used both in DOE-complex and the commercial world.
• availability	60	Although operator error can cause downtime, add 10 points to the median score of 50 because system is normally available 50% of the time.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form can be ground up and reprocessed.
• schedule for treatment of waste	80	Mature technology. Vendor will bring onsite and set up with a minimum delay.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	70	Requires the same number of non-operational workers as comparable skid-mounted units. Most or all initial construction can be done in a vendor shop. Experience in similar facilities indicates that little non-routine maintenance is required. Subtract 10 points from median score of 80 because of uncertainties surrounding D&D efforts.
• operational worker potential exposure	40	Subtract 10 points from the median score of 50 because the facility requires more operational workers than comparably sized, skid mounted facilities.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be in full compliance without needing a variance.
• ability to obtain a permit	80	Must demonstrate that waste meets treatment standard.
• waste disposal	40	Subtract 10 points from the median score of 50 because HEPA filters can go to LLW disposal. Filter frames must have HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-4
Facility: Vendor/Onsite Treatment Technology Polymer
In-Depth Options Analysis Score Sheet Encapsulation

Attribute	Score	Discussion/Notes
<i>Cost Considerations</i>		
• life cycle cost	65	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 56 Total 65

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-4
Facility: Vendor/Onsite Treatment Technology Polymer
Cost Estimate Sheet Encapsulation

INCLUDES COST OF OPTION SR-W051-2

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 174	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 697	
1.3.2 Safety Assurance Documentation	\$ 174	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 1320
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 880	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 280	
2.7 Contingency	\$ 1806	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2966
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 28	
3.2 Annual Utilities	\$ 1	
3.3 Annual Materials	\$ 17	
3.4 Annual Maintenance	\$ 10	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 56	
X NUMBER OF YEARS OF OPERATION	4.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 225
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 3200	
4.2 Closure, Post-Closure, Monitoring	\$ 25	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 3225
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 4000	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 4000
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 500
SUB COST FOR POLYMER ENCAPSULATION MODULE		\$ 12236
ESCALATION		1.06
TOTAL COST		\$ 12970

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-5
Facility: Containment Building Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- Process satisfies requirements of the "debris rule" and all applicable LDR standards are met.
- Can process a wide range of materials without loss of efficiency due to off design input.
- S. S. containers will meet current DOT shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- All processes involved are existing technology.
- Similar systems have demonstrated availability of >80%.
- Failure does not produce altered waste form. A failed container is easily fixed.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.
- Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
- Exposure controlled by design, but fewer than average number of workers and potential for exposure is limited.

Cons

- Not a budget item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	50	HEPA filters removed will require disposal by standard technology.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-5
Facility: Containment Building Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• flexibility	80	Can process a wide range of materials without loss of efficiency due to off design input.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved are existing technology.
• availability	80	Similar systems have demonstrated availability of >80%.
• scalability	50	Throughput is set by design and not easily expanded except by adding additional shifts of operation.
• remedial measures	90	Failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container is easily fixed.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	80	Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
• operational worker potential exposure	80	Exposure controlled by design, but fewer than average number of workers and potential for exposure is limited.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process satisfies requirements of the "debris rule."
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	40	Subtract 10 points from the median score of 50 because HEPA filters can be disposed of as LLW. Filter frames require HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the wasteform is not as permanent as vitrification.
<i>Cost Considerations</i>		
• life cycle cost	75	
• funding availability	20	Not a budget item, will require line item funding.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-5
Facility: Containment Building Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because no private sector involvement is anticipated.

IDOA Score: Technical 58 Total 68

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-5
Facility: Containment Building Treatment Technology S. S. Box
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 58	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 233	
1.3.2 Safety Assurance Documentation	\$ 58	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 669
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 253	
2.2 Inspection	\$ 76	
2.3 Project Management	\$ 121	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 150	
2.6 Construction Management	\$ 81	
2.7 Contingency	\$ 604	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2284
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 225	
3.2 Annual Utilities	\$ 9	
3.3 Annual Materials	\$ 135	
3.4 Annual Maintenance	\$ 81	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 450	
X NUMBER OF YEARS OF OPERATION	4.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 1800
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 920	
4.2 Closure, Post-Closure, Monitoring	\$ 43	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 963
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 850
SUB COST FOR MACROENCAPSULATION MODULE		\$ 6566
ESCALATION		1.308
TOTAL COST		\$ 8589

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters

Option Number: SR-W011-6

Facility: INEL/WEDF

Treatment Technology Stabilization

Treatment Technology

The INEL WEDF Stabilization process provides treatments for aqueous and organic liquids and debris. The process stabilizes waste in a grout matrix to reduce leachability.

Pros

- No secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	No secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-6
Facility: INEL/WEDF Treatment Technology Stabilization
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the States acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The treated waste will be classified as mixed waste which will require disposal in an HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	50	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 65

Waste Stream Number & Name: SR-W011 Cadmium Coated HEPA Filters
Option Number: SR-W011-6
Facility: INEL/WEDF Treatment Technology Stabilization
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 320
7.0 Transportation		\$ 387
8.0 Disposal		\$ 500
SUB COST FOR INCINERATOR MODULE		\$ 1207
ESCALATION		1.06
TOTAL COST		\$ 1279

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W011

Cadmium Coated HEPA Filters

Option Number: SR-W011-7

Facility: Vendor

Treatment Technology Plasma Hearth

Treatment Cycle Flow Diagram:

Option rejected during technical success factor evaluation. No further analysis performed.

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Summary Page

Waste Stream Number & Name: SR-W012 Toxic Clean Up Material

Background Information

Various clean up materials, such as rags, wipes, mopheads, gloves, etc., contaminated with toxic, characteristic, hazardous waste and radioactive materials. The waste stream is a collection of similar debris whose LDR treatment standards can be met by incineration followed by stabilization. The list of waste codes indicate the components which may be present in the waste. Waste from specific areas within SRS may not contain all the waste codes.

Volume

- Current volume through 09/30/93 is 0.8 m³.
- Expected 1993-1997 volume will be 1.0 m³.

Waste Stream Composition

- Organic Debris

Waste Code

- D004A (TCLP As), D005A (TCLP Ba), D006A (TCLP Cd), D007A (TCLP Cr), D008A (TCLP Pb), D009A (TCLP Hg), D009B (high organic Hg), D009C (high inorganic Hg), D010A (TCLP Se), D011A (TCLP Ag), D018 (benzene)

LDR Treatment Standard

- D004A-D011A concentration based standard - 0.2-100 mg/l
- D009B = Specified Technology - Incineration of wastes containing organics and mercury
- D009C = Specified Technology - Retorting or roasting in a thermal processing unit capable of volatilizing mercury
- D018 = no treatment standard yet developed by EPA
- Alternate debris technology may be applied

Waste Characterization

- Some process knowledge used to characterize the waste stream.
- Confidence level is medium because no analytical data is available. Confidence level is based on knowing some information on the nature of the spill and concentration of the liquids cleaned up.

Radiological Characterization

- Alpha (U²³⁵, Pu²³⁸, Pu²³⁹) and Beta/Gamma Emitter (Cs¹³⁷) emitters present.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for the Toxic Clean Up Material waste stream is Incineration in the Consolidated Incineration Facility.

Treatment Justification

In-depth options analysis was not performed for this waste stream.

During development of the Consolidated Incineration Facility (CIF) design basis, a determination was made of the types and volumes of hazardous, low level radioactive, and mixed Savannah River Site (SRS) waste streams that would be generated in the future or were in storage for which treatment by incineration would be beneficial. The determination to initiate development of CIF was based on the facts that incineration was recommended or required by environmental regulations and a significant volume or toxicity reduction would

be achieved. The waste amenable to incineration were grouped by physical state, solid or liquid, and type of contamination, hazardous and/or radioactive. Some wastes such as Defense Waste Processing Facility benzene and low level radioactive job control waste were individually designated a waste group. The waste groups and current/future volume data were adopted as a design basis for the CIF Functional Performance Requirements (FPR), OPS-WMP-90-4140. The FPR serves as the baseline design document for the initiation of project development at the SRS.

Based on physical and chemical characteristics, the SRS Mixed wastes already designated for treatment at the CIF fall into one of the CIF design basis waste groups listed as follows:

FPR Waste Group

Beta/Gamma Boxed (Solid)

High BTU (Liquid)

Chlorinated (Liquid)

DWPF Organic

Naval Fuel Organic

SRS Mixed Waste Streams

Solvent Contaminated Debris (SR-W003)

Toxic Clean Up Material (SR-W012)

Scintillation Solution (SR-W010)

Radioactive Contaminated Solvents (SR-W001)

Radioactive Contaminated

Chlorofluorocarbons (SR-W002)

Freon 11/Oil (SR-W035)

DWPF Benzene (SR-W022)

Spent Methanol (SR-W030)

Some of the CIF design basis waste groups listed in the table are designated in the FPR as nonradioactive hazardous waste. The radioactive nature of the waste does not impact its combustion characteristics. The operation and efficiency of the CIF combustion and air pollution control systems are not influenced by the presence of radioactivity. A mixed waste that meets the chemical and physical criteria of a design basis nonradioactive waste group can be treated in the CIF as effectively as the nonradioactive waste.

The CIF Mission Need and Design Capacity Review (07/07/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (JCW) (SWE-CIF-93020, 07/29/93) reevaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to generally reexamine the appropriateness of each FPR design basis waste group and additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to an FPR nonradioactive waste group. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA Land Disposal Restriction requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Alternative Technologies Investigated

Acid Digestion

An emerging technology for treatment of mixed JCW is Catalyzed Nitric Acid Oxidation which is being developed by the Savannah River Technology Center. In this developmental process, the solids are processed in a nitric acid bath with a metal catalyst for oxidation of the organics and dissolution of the solids. Preliminary testing indicates that the process successfully dissolves cellulose and neoprene, but is unsuccessful in dissolving polyethylene and polyvinyl chloride (PVC). Polyethylene and PVC account for approximately 30% wt of the JCW. The organic constituents are oxidized to carbon dioxide by the acid, and the metal contaminants are brought into solution. The resulting spent acid solution, with dissolved hazardous metals, would be treated in a chemical precipitation process to remove the metals and neutralize the solution prior to disposal through a permitted outfall. This technology is only in the development stage and has several safety and environmental issues requiring resolution.

Thermal Desorption

A possible treatment of this waste is by thermal desorption even though it is not demonstrated for this waste stream. Thermal desorption is typically used for volatilization of organics from soils at lower temperatures than provided by incineration. The desorption unit is equipped with an offgas system containing a carbon bed or organics condensation system to prevent environmental release of volatilized organics. Typical process operating temperatures (350°F - 600°F) are below the autoignition temperature of most JCW. The volatile organics would be volatilized and captured, while the treated solids could be compacted or incinerated before disposal. However, the plastics in the JCW begin to melt and volatilize at approximately 250°F (WSRC-TR-93-293). Therefore, this treatment is not practical for SRS JCW. Also, since these wastes contain hazardous metals, the solids would require further treatment prior to disposal.

Other Alternative Technologies

Several other possible alternative technologies are discussed in the CIF Mission Need and Design Capacity Review. These technologies are either in the developmental stage or have not demonstrated on organic and metal contaminated cellulose and plastic waste. Chemical oxidation processes will react with the cellulose and plastic and generate large volumes of partially oxidized organics. A demonstrated process to separate the hazardous constituents (organics and metals) from the cellulose and plastics has not been identified.

Selected Treatment Technology

Since no acceptable alternative treatment technology for JCW contaminated with organics and heavy metals was identified, the selected technology is incineration followed by stabilization of the residuals. Incineration destroys organic constituents, generated a residual which is easily stabilized, and significantly reduces the volume of waste requiring a disposal. Incineration is the treatment technology currently used by industry for treatment of this waste type.

Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE STREAM SR-W001. SEE COST ESTIMATE SHEET FOR SR-W001.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined Elemental Lead)

Background Information

In the Mixed Waste Inventory Report, SR-W013 is reported as a single waste stream. However, when evaluation of the waste stream for treatment options began, it was recognized the stream should be divided into its two distinct components. Thus, the stream numbers have been changed with the additions of an A or B suffix. This portion of the waste (approximately 50% of the waste stream volume) consists of elemental lead which can be decontaminated and reused.

Volume

- Current volume through 09/30/93 is 86.4 m³.
- Expected 1993-1997 volume will be 30 m³.

Waste Stream Composition

- Elemental lead

Waste Code

- D008C – (elemental Pb)

LDR Treatment Standard

- D008C = specified technology – macroencapsulation for lead

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based on the fact that waste is easily identified as containing lead.

Radiological Characterization

- Transuranic contaminants from Pu²³⁸, Pu²³⁹, Beta/Gamma Emitter of Cs¹³⁷, Sr⁹⁰, and U²³⁵.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Ashcrete	Ashcrete encapsulation will not meet BDAT QC requirements.
CIF	Incineration	CIF would melt Pb. It has no provision for handling molten metal.
ETF	Wastewater	ETF has no equipment to treat Pb.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
LEFT	Wastewater	LEFT has no equipment to decontaminate Pb.
M-Area	Vitrification	Lead must be recovered per LDR rules.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined Elemental Lead)

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF	IDOA Scores		COST (x 1000)	PO
			Score	Tech.	Total		
SR-W013A-1	Vendor 1	Decon	88	68	82	627	√
SR-W013A-2	Vendor 2	Decon	88	68	82	627	
SR-W013A-3	Cont. Bldg.	Decon	51	51	52	32019	
SR-W013A-4	Vendor	Mineralization	26				

Options Rejected Due To Low Technology Success Factor

Mineralization Treatment by Vendor

Mineralization treatment entails a carefully controlled chemical reaction to produce from the lead waste a compound with a particular mineral composition and crystal structure.

Mineralization treatment was rejected because:

- It has not been demonstrated outside the laboratory. Hence, $P_m=0.9$.
- Controls of the process and equipment needed are poorly specified, but can be assumed to be complex. Hence $P_c=0.5$.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the LLW Lead (Uncombined Elemental Lead) waste stream is Decontamination in an offsite vendor treatment facility.

This option is preferred because:

- The volume of the material going to disposal is reduced by more than a factor of 5.
- The volume of secondary waste is small.
- The vendor process is currently in operation.
- Vendor decontamination is cost effective.

Options Rejected During IDOA

Decontamination in a Containment Building

Decontamination in a Containment Building was rejected because:

- It is less cost effective than decontamination at a vendor's facility

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined Elemental Lead)
Option Number: SR-W013A-1
Facility: Vendor (Offsite) Treatment Technology Decon (Vendor 1)

Treatment Cycle Flow Diagram:

Pros

- The volume reduction of the waste is much >5 because the only waste returned is waste that can not be decontaminated
- Small quantity of secondary waste is generated by the process and easily treated by existing technologies.
- The decontaminated lead is able to be shipped upon completion of the processes.
- Treatment results in decontaminated lead. Lead can be free-released and sold for reuse. Non decontaminated lead will meet the expected WAC after treatment at SRS.
- This is a proven process. A vendor treatment that is being used by both the commercial world and some parts of the DOE complex.
- System is simple to operate and generally available >80 of the time.
- Process failure does not result in a waste that can not be treated by existing processes. Alternative treatments exist for the waste. Process is on the vendor's site.
- Treatment will take place in an existing, permitted, offsite vendor facility. Schedule can be developed with great confidence.
- The process is on the vendor's site and is permitted.

Cons

- Constituents of concern are not permanently isolated from the environment.

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined
Option Number: SR-W013A-1 Elemental Lead)
Facility: Vendor (Offsite) Treatment Technology Decon (Vendor 1)
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	80	The volume reduction of the waste is much greater than 5 times the original waste volume because the only waste returned is waste that can not be decontaminated
• secondary waste generation	80	Small quantity is generated by the process and easily treated by existing technologies.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because total process produces wastes that meet LDR restrictions.
• flexibility	40	This process will only handle pure lead such as sheet lead. Subtract 10 points from the median score of 50 because process is not tolerant of residues such as glue from tape or certain type of marking pen ink.
• ability to be shipped	80	The decontaminated lead is able to be shipped upon completion of the processes.
• final waste form	80	Treatment results in decontaminated lead. Lead can be free-released and sold for reuse. Non decontaminated lead will meet the expected WAC after treatment at SRS.
<i>Engineering Parameters</i>		
• system implementability	100	This is a proven process. Add 20 points to the median score of 80 because a vendor treatment that is being used by both the commercial world and some parts of the DOE complex.
• availability	80	Although operator error can cause downtime, system is simple to operate and generally available >80 of the time.
• scalability	50	Throughput is set by design and not easily expandable except by adding more shifts.
• remedial measures	100	Process failure does not result in a waste that can not be treated by existing processes. Add 20 points to the median score of 80 because alternate treatments exist for the waste. Process is on the vendor's site. Remedial measures has no impact on SRS.
• schedule for treatment of waste	100	Treatment will take place in an existing, permitted, offsite vendor facility. Add 20 points to the median score of 80 because schedule can be developed with great confidence.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	100	The process is on vendor's site. Add 20 points to the median score because of 80 vendor's remedial measures have no impact on SRS.
• non-operational worker potential exposure	80	Will require 5-6 loaders to load the waste containers on the truck for shipment.
• operational worker potential exposure	100	Processing takes place in vendor's facility. Add 20 points to median score of 80 because process is currently in operation and vendor personnel are trained and experienced in its operation.
• transportation potential exposure	50	Drums must be transported 200 miles to the vendor's site. Non decontaminated lead must be returned to SRS.

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined
Option Number: SR-W013A-1 Elemental Lead)
Facility: Vendor (Offsite) Treatment Technology Decon (Vendor 1)
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Regulatory Parameters</i>		
• need for variance	100	The process is at the vendors site. Add 20 points to the median score of 80 because vendor's compliance with the regulations has no impact on SRS.
• ability to obtain a permit	100	Add 20 points to the median score of 80 because the process is on the vendor's site and is permitted.
• waste disposal	70	Subtract 10 points from the median score of 80 because non decontaminated lead must be returned to SRS for treatment and HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Constituents of concern are not permanently isolated from the environment.
<i>Cost Considerations</i>		
• life cycle cost	98	
• funding availability	50	Expected to be funded by operational costs, but budget will have to be increased to cover expenditures.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 68 Total 82

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined
Option Number: SR-W013A-1 Elemental Lead)
Facility: Vendor (Offsite) Treatment Technology Decon (Vendor 1)
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: Vendor facility
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 3	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 0	
1.3.2 Safety Assurance Documentation	\$ 3	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 157
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 0	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 0	
2.7 Contingency	\$ 35	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 35
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 19	
3.2 Annual Utilities	\$ 1	
3.3 Annual Materials	\$ 11	
3.4 Annual Maintenance	\$ 7	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 38	
X NUMBER OF YEARS OF OPERATION	4.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 150
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 0	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 0
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 100	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 100
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 150
SUB COST FOR DECONTAMINATION MODULE		\$ 592
ESCALATION		1.06
TOTAL COST		\$ 627

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined Elemental Lead)
Option Number: SR-W013A-2
Facility: Vendor (Offsite) Treatment Technology Decon (Vendor 2)

Treatment Cycle Flow Diagram:

Pros

- The volume reduction of the waste is much >5 because the only waste returned is waste that can not be decontaminated.
- Small quantity is generated by the process and easily treated by existing technologies.
- The decontaminated lead is able to be shipped upon completion of the processes.
- Treatment results in decontaminated lead. The lead can be free-released and sold for reuse. Non decontaminated lead will meet the expected WAC after treatment at SRS.
- This is a proven process. A vendor treatment that is being used by both the commercial world and some parts of the DOE complex.
- Although operator error can cause downtime, system is simple to operate and generally available >80% of the time.
- Process failure does not result in a waste that can not be treated by existing processes and alternate treatments do exist for the waste. Process is on the vendor's site.
- This treatment will take place in an existing, permitted, offsite vendor facility. Schedule can be developed with great confidence.

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined
Option Number: SR-W013A-2 Elemental Lead)
Facility: Vendor (Offsite) Treatment Technology Decon (Vendor 2)

Pros (contd)

- The process is on vendor's site. Vendor's remedial measures have no impact on SRS.
- The process is on the vendor's site and is permitted.
- Non-decontaminated lead must be returned to SRS for treatment and RCRA permitted disposal.

Cons

- Constituents of concern are not permanently isolated from the environment.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	80	The volume reduction of the waste is much >5 because the only waste returned is waste that can not be decontaminated.
• secondary waste generation	80	Small quantity is generated by the process and easily treated by existing technologies.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because total process produces wastes that meet LDR restrictions.
• flexibility	40	The process will only handle pure lead, such as sheet lead. Subtract 10 points from the median score of 50 because process is not tolerant of residues such as glue from tape or certain types of marking pen ink.
• ability to be shipped	80	The decontaminated lead is able to be shipped upon completion of the processes.
• final waste form	80	Treatment results in decontaminated lead. The lead can be free-released and sold for reuse. Non decontaminated lead will meet the expected WAC after treatment at SRS.
<i>Engineering Parameters</i>		
• system implementability	100	This is a proven process. Add 20 points to the median score of 80 because a vendor treatment that is being used by both the commercial world and some parts of the DOE complex.
• availability	80	Although operator error can cause downtime, system is simple to operate and generally available >80% of the time.
• scalability	50	Throughput is set by design and not easily expandable except by adding more shifts.
• remedial measures	100	Process failure does not result in a waste that can not be treated by existing processes. Add 20 points to the median score of 80 because alternate treatments do exist for the waste. Process is on the vendor's site. Remedial measures has no impact on SRS.
• schedule for treatment of waste	100	This treatment will take place in an existing, permitted, offsite vendor facility. Add 20 points to the median score of 80 because schedule can be developed with great confidence.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	100	The process is on vendor's site. Add 20 points to the median score of 80 because vendor's remedial measures have no impact on SRS.

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined
Option Number: SR-W013A-2 Elemental Lead)
Facility: Vendor (Offsite) Treatment Technology Decon (Vendor 2)
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• non-operational worker potential exposure	80	Will require 5-6 loaders to load the waste containers on the truck for shipment.
• operational worker potential exposure	100	Processing takes place in vendor's facility. Add 20 points to median score of 80 because process is currently in operation and vendor personnel are trained and experienced in its operation.
• transportation potential exposure	50	Drums must be transported 200 miles to the vendor's site. Non decontaminated lead must be returned to SRS.
<i>Regulatory Parameters</i>		
• need for variance	100	The process is at the vendors site. Add 20 points to the median score of 80 because vendor handles permitting.
• ability to obtain a permit	100	Add 20 points to the median score of 80 because the process is on the vendor's site and is permitted.
• waste disposal	70	Subtract 10 points from the median score of 80 because non-decontaminated lead must be returned to SRS for treatment and HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Constituents of concern are not permanently isolated from the environment.
<i>Cost Considerations</i>		
• life cycle cost	98	
• funding availability	50	Expected to be funded by operational costs, but budget will have to be increased to cover expenditures.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 68 Total 82

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined
Option Number: SR-W013A-2 Elemental Lead)
Facility: Vendor (Offsite) Treatment Technology Decon (Vendor 2)
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: Vendor facility
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 3	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 0	
1.3.2 Safety Assurance Documentation	\$ 3	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 157
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 0	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 0	
2.7 Contingency	\$ 35	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 35
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 19	
3.2 Annual Utilities	\$ 1	
3.3 Annual Materials	\$ 11	
3.4 Annual Maintenance	\$ 7	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 38	
X NUMBER OF YEARS OF OPERATION	4.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 150
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 0	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 0
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 100	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 100
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 150
SUB COST FOR DECONTAMINATION MODULE		\$ 592
ESCALATION		1.06
TOTAL COST		\$ 627

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined Elemental Lead)
Option Number: SR-W013A-3
Facility: Containment Building Treatment Technology Decontamination

Treatment Cycle Flow Diagram:

Pros

- Treatment is required to meet LDR.
- Waste form meets shipping requirements in the form it exits the treatment process.
- The waste form meets the expected WAC for disposal. Waste form is disposable in the form in which it exits the process.
- Process will be in full compliance with regulations without a variance.
- Small volume of secondary waste generated by removal of Pb from the etching solution will require treatment by existing technologies.
- Waste meets treatment standard and can be disposed of as LLW.

Cons

- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined
Option Number: SR-W013A-3 Elemental Lead)
Facility: Containment Building Treatment Technology Decontamination
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	60	Total waste volume for disposal will approximate original volume. Add 10 points to the median score of 50 because much of the decontaminated lead brick volume will be reusable.
• secondary waste generation	80	Small volume of secondary waste generated by removal of Pb from the etching solution will require treatment by existing technologies.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	50	System expected to be able to handle many wastes for which acid etching is a preferred treatment.
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.
• final waste form	100	The waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	60	The basic process is demonstrated. Add 10 points to the median score of 50 because shredding and acidizing Pb contaminated with plastic is unproved, may be difficult to install a process in a containment building.
• availability	50	System is normally available 50% of the time.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	40	Lead bricks and sheet lead that require additional decontamination can be recycled. Subtract 10 points from the median score of 50 because failure of lead salt removal by precipitation could lead to extensive re-treatment.
• schedule for treatment of waste	40	This is a mature technology, but containment building process will have to be designed. Subtract 10 points from the median score of 50 because installation in a containment building will add uncertainties.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	40	Maintenance of encapsulating material mixing equipment will require an average crew. Subtract 10 points from the median score of 50 because personal protective equipment needed for work in a containment building, even though the mixing equipment contains no radiation.
• operational worker potential exposure	40	An average crew is required to operate the equipment. Subtract 10 points from the median score of 50 because manual labor required to unload boxes and stack Pb in the encapsulation containers.

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined
Option Number: SR-W013A-3 Elemental Lead)
Facility: Containment Building Treatment Technology Decontamination
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be in full compliance with regulations without a variance.
• ability to obtain a permit	50	Proven process that has been permitted elsewhere.
• waste disposal	80	Waste meets treatment standard and can be disposed of as LLW.
<i>Public Acceptance</i>		
• public acceptance	30	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification). Add 10 points to the median score of 20 because much of the brick and sheet lead will be returned to use and not require disposal as waste.
<i>Cost Considerations</i>		
• life cycle cost	9	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	20	Similar processes are commercially available.
• private sector involvement	50	One qualified vendor has been identified who can provide this process.

IDOA Score: Technical 51 Total 52

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined)
Option Number: SR-W013A-3 Elemental Lead)
Facility: Containment Building **Treatment Technology** Decontamination
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 258	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 1033	
1.3.2 Safety Assurance Documentation	\$ 258	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 180	
TOTAL PRE-OPERATIONS		\$ 2005
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 1133	
2.2 Inspection	\$ 326	
2.3 Project Management	\$ 506	
2.4 Building Construction (inc. indirect)	\$ 4000	
2.5 Equipment (inc. indirect)	\$ 1150	
2.6 Construction Management	\$ 361	
2.7 Contingency	\$ 2679	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 10155
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 422	
3.2 Annual Utilities	\$ 17	
3.3 Annual Materials	\$ 253	
3.4 Annual Maintenance	\$ 152	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 844	
X NUMBER OF YEARS OF OPERATION	8.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 6750
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 4120	
4.2 Closure, Post-Closure, Monitoring	\$ 5	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 4125
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 100
SUB COST FOR DECONTAMINATION MODULE		\$ 23135
ESCALATION		1.384
TOTAL COST		\$ 32019

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W013A Low-Level Waste Lead (Uncombined Elemental Lead)
Option Number: SR-W013A-4
Facility: Vendor Treatment Technology Mineralization

Treatment Cycle Flow Diagram:

Option rejected during technical success factor evaluation. No further analysis performed.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)

Background Information

In the MWIR, SR-W013 is reported as a single waste stream. However, when evaluation of the waste stream for treatment options began, it was recognized that the stream should be divided into its two distinct components. Thus, the stream numbers have been changed with the addition of an A or B suffix. This portion, SR-W013B, consists of lead in the form of lead lined gloves, aprons, and mercury vapor lights, discarded equipment containing lead and other lead materials.

Volume

- Current volume through 09/30/93 is 86.4 m³.
- Expected 1993-1997 volume will be 30 m³.

Waste Stream Composition

- Elemental lead
- Non-elemental lead
- Lead acid batteries from radiological areas (less than 1% of the waste stream)

Waste Code

- D008B – (lead acid batteries)
- D008C – (elemental Pb)

LDR Treatment Standard

- D008B = specified technology – thermal recovery of lead in secondary lead smelters
- D008C = specified technology – macroencapsulation for lead

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based on the fact that waste is easily identified as containing lead.

Radiological Characterization

- Transuranic contaminants from Pu²³⁸, Pu²³⁹, Beta/Gamma Emitter of Cs¹³⁷, Sr⁹⁰, and U²³⁵.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Ashcrete	Ashcrete encapsulation will not meet BDAT QC requirements.
CIF	Incineration	CIF would melt Pb. It has no provision for handling molten metal.
ETF	Wastewater	ETF has no equipment to treat Pb.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
LEFT	Wastewater	LEFT has no equipment to decontaminate Pb.
M-Area	Vitrification	Lead must be recovered per LDR rules.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W013B-1	Vendor/Onsite	Polymer Encapsulation	100	57	65	17031	√
SR-W013B-2	Cont. Bldg.	Macro-encapsulation	75	55	57	32101	
SR-W013B-3	HW/MW-TB	Macro-encapsulation	81	53	53	49065	
SR-W013B-4	INEL/WEDF	Stabilization	*	51	59	19712	
SR-W013B-5	INEL/WEDF	Macro-encapsulation	*	46	54	19712	

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

- No options were rejected.

Engineering Assessment

Preferred Option Justification

The preferred option for the LLW Lead (Combined Lead) waste stream is Macroencapsulation in vinyl polymer encapsulation onsite by vendor treatment.

This option is preferred because:

- The final waste form meets LDR.
- It is a proven process that has been used both in the DOE complex and in the commercial world.
- It is a specified treatment technology.
- It is cost effective.

Treatability Study Requirements

The vendor will demonstrate that polymer encapsulation of low-level waste lead, which is inseparably mixed with non-lead components (e.g., plastic coating) and unsuited for decontamination, is capable of producing a stable monolith.

Options Rejected During IDOA

Macroencapsulation (either by a vendor or in a Containment Building)

Macroencapsulation (either by a vendor or in a Containment Building) for all the contaminated lead was rejected because:

- Rejected options scored 17 or more points less than the preferred option in the model evaluation, which was thought to be significant.
- Waste volume more than doubles
- Rejected options were less cost efficient than reuse.

Stabilization at INEL/WEDF

Stabilization at INEL/WEDF (encapsulating the lead waste with a grout matrix) was rejected because:

- Large volume waste streams are designated to be treated onsite.
- It is less cost effective than equally effective treatment at a vendor's facility.
- Waste volume more than doubles.
- Existing process will have to be expanded to handle this waste.

Macroencapsulation at INEL/WEDF

Macroencapsulation at INEL/WEDF (encapsulating waste with polymer) was rejected because:

- Large volume waste streams are designated to be treated onsite.
- It is assumed to be less cost effective than treatment at a vendor's facility.
- INEL did not recommend WEDF treatment of this waste stream.
- Waste volume more than doubles.
- Existing process will have to be expanded to handle this waste.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-1
Facility: Vendor/Onsite

Treatment Technology Polymer
Encapsulation

Treatment Cycle Flow Diagram:

Pros

- No secondary waste is generated.
- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form meets shipping requirements in the form it exits the treatment process.
- The waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- This is a proven process, used both in DOE-complex and the commercial world.
- Mature technology. Vendor will bring onsite and set up with a minimum delay.
- Process can be installed in a building with adequate emission controls.
- Skid mounted, no D&D, vendor removes upon completion of work. Facility requires more non-operational workers than comparably sized, skid mounted facilities.
- Process is in full compliance without needing a permit.
- This is the specified treatment technology.

Cons

- The waste volume will more than double.
- Waste requires HW/MW disposal.
- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because the waste volume will more than double.
• secondary waste generation	100	Add 20 points to the median score of 80 because no secondary waste is generated.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-1
Facility: Vendor/Onsite
In-Depth Options Analysis Score Sheet

Treatment Technology Polymer
Encapsulation

Attribute	Score	Discussion/Notes
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.
• final waste form	100	The waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because this is a proven process, used both in DOE-complex and the commercial world.
• availability	60	Add 10 points to the median score of 50 because system is normally available 50+% of the time.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form can be ground up and reprocessed.
• schedule for treatment of waste	80	Mature technology. Vendor will bring onsite and set up with a minimum delay.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	70	Requires the same number of non-operational workers as comparable skid-mounted units. Most or all initial construction can be done in a vendor shop. Experience in similar facilities indicates that little non-routine maintenance is required. Subtract 10 points from median score of 80 because of uncertainties surrounding D&D efforts.
• operational worker potential exposure	40	Subtract 10 points from the median score of 50 because the facility requires more operational workers than comparably sized, skid mounted facilities.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process is in full compliance without needing a permit.
• ability to obtain a permit	80	This is the specified treatment technology.
• waste disposal	20	Waste requires HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	51	
• funding availability	20	Not a budgeted item, will require line item funding.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-1
Facility: Vendor/Onsite Treatment Technology Polymer
In-Depth Options Analysis Score Sheet Encapsulation

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 57 Total 65

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-1
Facility: Vendor/Onsite
Cost Estimate Sheet

Treatment Technology Polymer
Encapsulation

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 212	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 848	
1.3.2 Safety Assurance Documentation	\$ 212	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 68	
TOTAL PRE-OPERATIONS		\$ 1614
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 330	
2.2 Inspection	\$ 105	
2.3 Project Management	\$ 173	
2.4 Building Construction (inc. indirect)	\$ 1500	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 105	
2.7 Contingency	\$ 2198	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 4411
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 94	
3.2 Annual Utilities	\$ 4	
3.3 Annual Materials	\$ 56	
3.4 Annual Maintenance	\$ 34	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 188	
X NUMBER OF YEARS OF OPERATION	4.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 750
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 4400	
4.2 Closure, Post-Closure, Monitoring	\$ 43	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 4443
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 4000	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 4000
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 850
SUB COST FOR POLYMER ENCAPSULATION MODULE		\$ 16067
ESCALATION		1.06
TOTAL COST		\$ 17031

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-2
Facility: Containment Building Treatment Technology Macro Encapsulation

Treatment Cycle Flow Diagram:

Pros

- No secondary waste is generated.
- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form meets shipping requirements in the form it exits the treatment process.
- The waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- Encapsulation with plastic is a proven process. Used both in DOE-complex and the commercial world.
- Well accepted waste form. No variance needed.

Cons

- Volume of material to disposal will increase owing to the amount of encapsulating material required.
- Waste requires HW/MW disposal.
- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
Process Parameters		
• volume alteration	20	Volume of material to disposal will increase owing to the amount of encapsulating material required.
• secondary waste generation	100	Add 20 points to the median score of 80 because no secondary waste is generated.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-2
Facility: Containment Building
In-Depth Options Analysis Score Sheet

Treatment Technology Macro
Encapsulation

Attribute	Score	Discussion/Notes
• final waste form	100	The waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	Encapsulation with plastic is a proven process. Add 20 points to the median score of 80 because it is used both in DOE-complex and the commercial world.
• availability	50	System is normally available 50% of the time.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form can be treated by other methods but requires extensive manual labor to correct process failure.
• schedule for treatment of waste	40	This is mature technology, but containment building process will have to be designed. Subtract 10 points from the median score of 50 because installation in a containment building will add uncertainties.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	40	Maintenance of encapsulating material mixing equipment will require an average crew. Subtract 10 points from the median score of 50 because personal protective equipment needed for work in a containment building, even though the mixing equipment contains no radiation.
• operational worker potential exposure	40	An average crew is required to operate the equipment. Subtract 10 points from the median score of 50 because manual labor is required to unload boxes and stack Pb in the encapsulation containers.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Well accepted waste form. No variance needed.
• ability to obtain a permit	50	Encapsulation is the specified technology.
• waste disposal	80	Waste requires HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	8	
• funding availability	20	Not a budgeted item, will require line item funding.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-2
Facility: Containment Building Treatment Technology Macro
In-Depth Options Analysis Score Sheet Encapsulation

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	20	Similar processes are commercially available.
• private sector involvement	50	One qualified vendor has been identified who can provide this process.

IDOA Score: Technical 55 Total 57

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-2
Facility: Containment Building **Treatment Technology** Macro
Cost Estimate Sheet Encapsulation

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 254	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 1018	
1.3.2 Safety Assurance Documentation	\$ 254	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 77	
TOTAL PRE-OPERATIONS		\$ 1879
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 1170	
2.2 Inspection	\$ 264	
2.3 Project Management	\$ 341	
2.4 Building Construction (inc. indirect)	\$ 1716	
2.5 Equipment (inc. indirect)	\$ 3600	
2.6 Construction Management	\$ 372	
2.7 Contingency	\$ 2639	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 10102
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 422	
3.2 Annual Utilities	\$ 17	
3.3 Annual Materials	\$ 253	
3.4 Annual Maintenance	\$ 152	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 844	
X NUMBER OF YEARS OF OPERATION	8.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 6750
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 4253	
4.2 Closure, Post-Closure, Monitoring	\$ 10	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 4263
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 200
SUB COST FOR MACROENCAPSULATION MODULE		\$ 23194
ESCALATION		1.384
TOTAL COST		\$ 32101

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-3
Facility: HW/MW-TB

Treatment Technology Macro
Encapsulation

Treatment Cycle Flow Diagram:

Pros

- Decontamination is a simple technology. The material that is not decontaminated or can be easily decontaminated will be encapsulated.
- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form meets shipping requirements in the form it exits the treatment process.
- This waste form meets the expected WAC for disposal. Waste form is disposable in the form in which it exits the process.
- Encapsulation with plastic is a proven process. Used both in DOE-complex and the commercial world.
- Well accepted waste form. No variance needed.

Cons

- Volume of material to disposal will increase owing to the amount of encapsulating material required.
- Waste requires HW/MW disposal (RCRA Subtitle C facility).
- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-3
Facility: HW/MW-TB
In-Depth Options Analysis Score Sheet

Treatment Technology Macro
Encapsulation

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Volume of material to disposal will increase owing to the amount of encapsulating material required.
• secondary waste generation	80	Decontamination is a simple technology. The material that is not decontaminated or can be easily decontaminated will be encapsulated.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.
• final waste form	100	This waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	Encapsulation with plastic is a proven process. Add 20 points to the median score of 80 because the process is used both in DOE-complex and the commercial world.
• availability	50	System is normally available 50% of the time.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form must be ground up and reprocessed.
• schedule for treatment of waste	50	Mature technology, but treatment building process will have to be designed.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	50	Maintenance of encapsulating material mixing equipment will require an average crew.
• operational worker potential exposure	40	An average crew is required to operate the equipment. Subtract 10 points from the median score of 50 because manual labor required to unload boxes and stack Pb in the encapsulation containers.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Well accepted waste form. No variance needed.
• ability to obtain a permit	50	Encapsulation is the specified treatment.
• waste disposal	20	Waste requires HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-3
Facility: HW/MW-TB Treatment Technology Macro
In-Depth Options Analysis Score Sheet Encapsulation

Attribute	Score	Discussion/Notes
<i>Cost Considerations</i>		
• life cycle cost	0	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	20	Similar processes are commercially available.
• private sector involvement	50	One qualified vendor has been identified who can provide this process.

IDOA Score: Technical 53 Total 53

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-3
Facility: HW/MW-TB
Cost Estimate Sheet

Treatment Technology Macro
Encapsulation

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 526	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 2102	
1.3.2 Safety Assurance Documentation	\$ 526	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 315	
TOTAL PRE-OPERATIONS		\$ 3743
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 2332	
2.2 Inspection	\$ 634	
2.3 Project Management	\$ 949	
2.4 Building Construction (inc. indirect)	\$ 7000	
2.5 Equipment (inc. indirect)	\$ 3600	
2.6 Construction Management	\$ 742	
2.7 Contingency	\$ 5450	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 20707
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 422	
3.2 Annual Utilities	\$ 17	
3.3 Annual Materials	\$ 253	
3.4 Annual Maintenance	\$ 152	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 844	
X NUMBER OF YEARS OF OPERATION	8.0	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 6750
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 8480	
4.2 Closure, Post-Closure, Monitoring	\$ 10	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 8490
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 200
SUB COST FOR INCINERATOR MODULE		\$ 39891
ESCALATION		1.23
TOTAL COST		\$ 49065

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-4
Facility: INEL/WEDF **Treatment Technology** Stabilization

Treatment Technology

The INEL WEDF Stabilization process provides treatments for aqueous and organic liquids and debris. The process stabilizes waste in a grout matrix to reduce leachability.

Pros

- No secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The treated waste will be classified as mixed waste which will require disposal in an HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	No secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-4
Facility: INEL/WEDF
In-Depth Options Analysis Score Sheet

Treatment Technology Stabilization

Attribute	Score	Discussion/Notes
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently under RCRA interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the States acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The treated waste will be classified as mixed waste which will require disposal in an HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	54	
• funding availability	50	Funding for treatment cost can be provide using the operating budget, however the additional costs may result in an increase in the budget in excess of 10.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 59

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-4
Facility: INEL/WEDF
Treatment Technology Stabilization
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL:
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ _____	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ _____	
1.3.2 Safety Assurance Documentation	\$ _____	
1.3.3 Permitting	\$ _____	
1.3.4 Preparation for Operations	\$ _____	
1.3.5 Project Management	\$ _____	
TOTAL PRE-OPERATIONS		\$ _____
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ _____	
2.2 Inspection	\$ _____	
2.3 Project Management	\$ _____	
2.4 Building Construction (inc. indirect)	\$ _____	
2.5 Equipment (inc. indirect)	\$ _____	
2.6 Construction Management	\$ _____	
2.7 Contingency	\$ _____	
TOTAL FACILITY CONSTRUCTION COSTS		\$ _____
3.0 Operation and Maintenance		
3.1 Annual Operating Labo:	\$ _____	
3.2 Annual Utilities	\$ _____	
3.3 Annual Materials	\$ _____	
3.4 Annual Maintenance	\$ _____	
3.5 Annual Contingency	\$ _____	
TOTAL ANNUAL O & M	\$ _____	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ _____
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ _____	
4.2 Closure, Post-Closure, Monitoring	\$ _____	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ _____
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ _____	
5.2 Mobile Treatment	\$ _____	
TOTAL CONTRACTED SERVICES		\$ _____
6.0 Offsite Treatment (DOE)		\$ 17,360
7.0 Transportation		\$ 387
8.0 Disposal		\$ 850
SUB COST FOR STABILIZATION MODULE		\$ 18,597
ESCALATION		1.06
TOTAL COST		\$ 19,712

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-5
Facility: INEL/WEDF Treatment Technology Macro Encapsulation

Treatment Technology

This facility will have a grout encapsulation process. Stabilization of the debris with the following reagents (or waste reagents) such that the leachability of the hazardous contaminants is reduced: (1) Portland cement; or (2) Lime/pozzolans (e.g., fly ash and cement kiln dust. Reagents (e.g., iron salts, silicates, and clay) may be added to enhance the set/cure time and/or compressive strength, or to reduce the leachability of the hazardous constituents.

Option Justification or Rejection Rationale:

INEL did not agree with this as a viable option. INEL recommended the ICPP debris treatment facility for treatment of this waste stream. The facility is also planned and unapproved. An additional reason for rejection is the basic assumption that large volume waste streams will be treated onsite.

Pros

- Few or no secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The macroencapsulated waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- The facility is anticipated to have less than 20% down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Macroencapsulation will increase the overall waste volume by a factor of 5 or more.
- A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon state approved permit modifications. In addition since this is a proposed facility the operating schedule is contingent upon receipt of DOE funding. The early stage of design also adds uncertainties.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- 80% of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Macroencapsulation will increase the overall waste volume by a factor of 5 or more.
• secondary waste generation	80	Few or no secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to macroencapsulation to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-5
Facility: INEL/WEDF
In-Depth Options Analysis Score Sheet

Treatment Technology Macro
Encapsulation

Attribute	Score	Discussion/Notes
• ability to be shipped	80	The macroencapsulated waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	50	The facility is currently being designed. Although individual treatment methods have been proven, an integrated facility has not been demonstrated.
• availability	80	The facility is anticipated to have less than 20% down time.
• scalability	50	The process is currently in the early design phase so additional modification could be incorporated.
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.
• schedule for treatment of waste	20	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon state approved permit modifications. In addition since this is a proposed facility the operating schedule is contingent upon receipt of DOE funding. The early stage of design also adds uncertainties.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Average number of non-operational workers is anticipated.
• operational worker potential exposure	50	Personnel exposure is expected to be average for operations of this type.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process will be permitted under a Part B Permit Application. Acceptance of offsite waste will require submission of a permit modification.
• ability to obtain a permit	50	Permitting process is well defined, however, the State's acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	80% of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	40	Public acceptance for macroencapsulation is reasonably positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process at INEL's location. Subtract 10 points because the constituent of concern is not eliminated permanently with macroencapsulation.
<i>Cost Considerations</i>		
• life cycle cost	54	
• funding availability	50	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-5
Facility: INEL/WEDF Treatment Technology Macro
In-Depth Options Analysis Score Sheet Encapsulation

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 46 Total 54

Waste Stream Number & Name: SR-W013B Low-Level Waste Lead (Combined Lead)
Option Number: SR-W013B-5
Facility: INEL/WEDF
Cost Estimate Sheet

Treatment Technology Macro
Encapsulation

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ _____	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ _____	
1.3.2 Safety Assurance Documentation	\$ _____	
1.3.3 Permitting	\$ _____	
1.3.4 Preparation for Operations	\$ _____	
1.3.5 Project Management	\$ _____	
TOTAL PRE-OPERATIONS		\$ _____
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ _____	
2.2 Inspection	\$ _____	
2.3 Project Management	\$ _____	
2.4 Building Construction (inc. indirect)	\$ _____	
2.5 Equipment (inc. indirect)	\$ _____	
2.6 Construction Management	\$ _____	
2.7 Contingency	\$ _____	
TOTAL FACILITY CONSTRUCTION COSTS		\$ _____
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ _____	
3.2 Annual Utilities	\$ _____	
3.3 Annual Materials	\$ _____	
3.4 Annual Maintenance	\$ _____	
3.5 Annual Contingency	\$ _____	
TOTAL ANNUAL O & M	\$ _____	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ _____
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ _____	
4.2 Closure, Post-Closure, Monitoring	\$ _____	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ _____
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ _____	
5.2 Mobile Treatment	\$ _____	
TOTAL CONTRACTED SERVICES		\$ _____
6.0 Offsite Treatment (DOE)		\$ 17,360
7.0 Transportation		\$ 387
8.0 Disposal		\$ 850
SUB COST FOR INCINERATOR MODULE		\$ 18,597
ESCALATION		\$ 1.06
TOTAL COST		\$ 19,712

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Summary Page – Initial Screening

Waste Stream Number & Name: SR-W014 Tritiated Mercury

Background Information

This waste stream is elemental mercury used as a pumping fluid for tritium gas. The mercury waste is generated from pump maintenance or pump failure due to mercury oxide fouling. The waste contains floating slag or an oxidized layer from the erosion/leaching of stainless steel pump housings and pipes. Most of the tritium contamination is in the floating mercury oxide layer.

Volume

- Current volume through 09/30/93 is 0.3 m³.
- Expected 1993-1997 volume will be 0.1 m³.

Waste Stream Composition

- Elemental Mercury

Waste Code

- D009D (Elemental mercury)

LDR Treatment Standard

- Specified technology = Amalgamation

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level high based on the fact waste is elemental mercury with a small oxide layer.

Radiological Characterization

- Total activity is 350 nCi/g with tritium present.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Ashcrete	Ashcrete will not micro encapsulate Hg so that it passes TCLP.
CIF	Incineration	CIF would volatilize Hg without equipment to control it. Also, tritium content exceeds CIF WAC.
ETF	Wastewater	ETF has no equipment to treat elemental Hg.
Lab.	Lab scale process flowsheet	Vitrification will not capture Hg in the glass.
LETF	Wastewater	LETF has no equipment to treat elemental Hg.
M-Area	Vitrification	Vitrifier has no provision to control volatilized Hg.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W014 Tritiated Mercury

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W014-1	INEL/WEDF	Amalgamation	*	51	65	228	√
SR-W014-2	Cont. Bldg.	Distill/Reuse	51	50	60	9846	
SR-W014-3	Cont. Bldg.	Distill/Amalg	51	44	53	10071	
SR-W014-4	HW/MW-TB	Distill/Amalg	51	44	50	18630	

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

- No options were rejected.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Tritiated Mercury waste stream is Amalgamation at an offsite DOE facility; the Idaho National Engineering Laboratory/Waste Engineering Development Facility (INEL/WEDF) – Amalgamation Unit.

This option treats the constituent of concern mercury by binding it with another metal into a non-leachable form (amalgam).

This option is preferred because:

- No secondary waste streams are generated.
- This waste stream is similar to the design basis waste for the facility.
- Treatment is BDAT.
- Offsite treatment is cost effective.

Options Rejected During IDOA

Distillation (followed by either reuse or amalgamation) in either a Containment Building or HW/MW-TB

Distillation (followed by either reuse or amalgamation) in either a Containment Building or HW/MW-TB was rejected because:

- None of the rejected options were as cost effective as the preferred option.
- Rejected options offered no technological advantage over the preferred option.

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Waste Stream Number & Name: SR-W014 Tritiated Mercury

Option Number: SR-W014-1

Facility: INEL/WEDF

Treatment Technology Amalgamation

Treatment Technology

This process is amalgamation. A process applicable to radioactive wastes containing mercury and particularly to wastes containing radioactive mercury isotopes. Mercury compounds are converted into a solid alloy with mercury and the amalgamating material, which is more easily managed and less mobile than solutions containing radioactive mercury. Amalgamation provides a change in mobility from liquid.

Pros

- No secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	No secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.

Waste Stream Number & Name: SR-W014 Tritiated Mercury
Option Number: SR-W014-1
Facility: INEL/WEDF Treatment Technology Amalgamation
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the state's acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	20	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 65

Waste Stream Number & Name: SR-W014 Tritiated Mercury
Option Number: SR-W014-1
Facility: INEL/WEDF Treatment Technology Amalgamation
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 98
7.0 Transportation		\$ 17
8.0 Disposal		\$ 100
SUB COST FOR AMALGAMATION MODULE		\$ 215
ESCALATION		1.06
TOTAL COST		\$ 228

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W014 Tritiated Mercury

Option Number: SR-W014-2

Facility: Containment Building

Treatment Technology Distill/Reuse

Treatment Cycle Flow Diagram:

Pros

- Significant reduction in waste volume as Hg is recovered for reuse.
- Final waste form will meet WAC.
- The process is commercially available.
- Small scale process. Availability will be of little concern.
- Potential for tritium release is small. Process will take place in a controlled area. Source is small.
- Process will comply with regulations without requiring a variance.
- Process is well-defined, and has been permitted in other locations.

Cons

- Increased throughput possible only by adding operating shifts.
- All traps will require disposal in HW/MW.
- Public concern may be allayed because Hg is recycled for reuse. Public concern with tritium release could be an issue.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	80	Significant reduction in waste volume as Hg is recovered for reuse.
• secondary waste generation	60	Subtract 20 points from the median score of 80 because of the number of different small volume waste streams.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because materials will be reused.
• flexibility	50	Process may require additional steps or equipment to handle off-design input streams.

Waste Stream Number & Name: SR-W014 Tritiated Mercury
Option Number: SR-W014-2
Facility: Containment Building Treatment Technology Distill/Reuse
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• ability to be shipped	50	There are no treatment residuals because material will be for reuse. Contaminated processing equipment will require simple treatment prior to shipment.
• final waste form	80	Final waste form will meet WAC.
<i>Engineering Parameters</i>		
• system implementability	70	The process is commercially available. Subtract 10 points from the median score of 80 because there are uncertainties arising from operation in a tritium environment.
• availability	80	Small scale process. Availability will be of little concern.
• scalability	20	Fixed by design. Increased throughput possible by adding operating shifts.
• remedial measures	50	Rupture or breakage of glass equipment will require a significant clean-up effort.
• schedule for treatment of waste	50	Some technology concerns about operating in a tritium environment.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Potential for tritium release is small. Process will take place in a controlled area. Source is small.
• non-operational worker potential exposure	40	The process equipment is small. Subtract 10 points from the median score of 50 because decommissioning costs would be high for a waste stream of such small volume of waste.
• operational worker potential exposure	50	An average number of operational workers will be required to tend this process.
• transportation potential exposure	50	Waste will require some additional characterization before transportation to storage.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will comply with regulations without requiring a variance.
• ability to obtain a permit	70	Subtract 10 points from the median score of 80 because process is well-defined, and has been permitted in other locations, tritium in the Hg.
• waste disposal	20	All traps will require disposal in HW/MW.
<i>Public Acceptance</i>		
• public acceptance	20	Public concern may be allayed because Hg is recycled for reuse. Public concern with tritium release could be an issue.
<i>Cost Considerations</i>		
• life cycle cost	72	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	20	Adaptation of existing technology.

Waste Stream Number & Name: SR-W014 Tritiated Mercury
Option Number: SR-W014-2
Facility: Containment Building Treatment Technology Distill/Reuse
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• private sector involvement	0	No private sector companies have experience with Tritium. Subtract 20 points from the median score of 20 because little or no interest is anticipated because of stakeholder concerns on Tritium and the amount of waste to be treated.

IDOA Score: Technical 50 Total 60

Waste Stream Number & Name: SR-W014 Tritiated Mercury
Option Number: SR-W014-2
Facility: Containment Building **Treatment Technology** Distill/Reuse
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled

Module Location: SRS

Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 109	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 436	
1.3.2 Safety Assurance Documentation	\$ 109	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 850
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 495	
2.2 Inspection	\$ 120	
2.3 Project Management	\$ 165	
2.4 Building Construction (inc. indirect)	\$ 1020	
2.5 Equipment (inc. indirect)	\$ 1250	
2.6 Construction Management	\$ 158	
2.7 Contingency	\$ 1131	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 4319
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 188	
3.2 Annual Utilities	\$ 8	
3.3 Annual Materials	\$ 113	
3.4 Annual Maintenance	\$ 68	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 375	
X NUMBER OF YEARS OF OPERATION	2.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 750
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 1800	
4.2 Closure, Post-Closure, Monitoring	\$ 3	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1803
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 50
SUB COST FOR DISTILL AND REUSE MODULE		\$ 7771
ESCALATION		1.267
TOTAL COST		\$ 9846

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W014 Tritiated Mercury

Option Number: SR-W014-3

Facility: Containment Building

Treatment Technology Distill/Amalg

Treatment Cycle Flow Diagram:

Pros

- LDR will be met without further treatment.
- All treatment residuals will be able to be shipped without further treatment.
- Final waste form will meet WAC.
- The process is commercially available.
- Small scale process. Availability will be of little concern.
- Potential for tritium release is small. Process will take place in a controlled area. Source is small.
- Process will comply with regulations without requiring a variance.
- The process is well-defined, and has been permitted in other locations.

Cons

- Waste volume increases by a factor of 2 because of the amalgam.
- Process may require additional steps or equipment because special precautions with tritium.
- Fixed by design and does not accept a range of inputs.
- Owing to the small batch size, it is expected that this will be a labor intensive process.
- Amalgam will require disposal in HW/MW.
- Public will feel concern because this process does not produce as permanent a waste form as vitrification and tritium may be an issue.
- Not a budgeted item, will require line item funding.

Waste Stream Number & Name: SR-W014 Tritiated Mercury
Option Number: SR-W014-3
Facility: Containment Building Treatment Technology Distill/Amalg
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because waste volume increases by a factor of 2 because of the amalgam.
• secondary waste generation	40	Subtract 10 points from the median score of 50 because contaminated process equipment created.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because LDR will be met without further treatment.
• flexibility	20	Process may require additional steps or equipment because special precautions with tritium.
• ability to be shipped	80	All treatment residuals will be able to be shipped without further treatment.
• final waste form	80	Final waste form will meet WAC.
<i>Engineering Parameters</i>		
• system implementability	70	The process is commercially available. Subtract 10 points from the median score of 80 because there are uncertainties arising from operation in a tritium environment.
• availability	80	Small scale process. Availability will be of little concern.
• scalability	20	Fixed by design and does not accept a range of inputs.
• remedial measures	50	Failure to amalgamate can be addressed by reprocessing with more reagents.
• schedule for treatment of waste	50	Some technology concerns about operating in a tritium environment.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Potential for tritium release is small. Process will take place in a controlled area. Source is small.
• non-operational worker potential exposure	40	The process equipment is small. Subtract 10 points from the median score of 50 because decommissioning costs will be high for a waste stream of such small volume.
• operational worker potential exposure	20	Owing to the small batch size, it is expected that this will be a labor intensive process.
• transportation potential exposure	50	Waste will require some additional characterization before transportation to storage.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will comply with regulations without requiring a variance.
• ability to obtain a permit	70	The process is well-defined,. Subtract 10 points from the median score of 80 because has been permitted in other locations, tritium in the Hg.
• waste disposal	20	Amalgam will require disposal in HW/MW.
<i>Public Acceptance</i>		
• public acceptance	20	Public will feel concern because this process does not produce as permanent a waste form as vitrification and tritium may be an issue.

Waste Stream Number & Name: SR-W014 Tritiated Mercury
Option Number: SR-W014-3
Facility: Containment Building Treatment Technology Distill/Amalg
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Cost Considerations</i>		
• life cycle cost	71	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	20	Adaptation of existing technology.
• private sector involvement	0	No private sector companies have experience with tritium. Subtract 20 points from the median score of 20 because little or no interest is anticipated because of stakeholders concerns on tritium and the amount of waste to be treated.

IDOA Score: Technical 44 Total 53

Waste Stream Number & Name: SR-W014 Tritiated Mercury
Option Number: SR-W014-3
Facility: Containment Building Treatment Technology Distill/Amalg
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 109	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 436	
1.3.2 Safety Assurance Documentation	\$ 109	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 975
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 495	
2.2 Inspection	\$ 120	
2.3 Project Management	\$ 165	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 1250	
2.6 Construction Management	\$ 158	
2.7 Contingency	\$ 1131	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 4319
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 1500	
3.2 Annual Utilities	\$ 60	
3.3 Annual Materials	\$ 900	
3.4 Annual Maintenance	\$ 540	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 3000	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 750
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 1800	
4.2 Closure, Post-Closure, Monitoring	\$ 5	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1805
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 100
SUB COST FOR DISTILL/AMALG MODULE		\$ 7948
ESCALATION		1.267
TOTAL COST		\$ 10071

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W014 Tritiated Mercury

Option Number: SR-W014-4

Facility: HW/MW-TB

Treatment Technology Distill/Amalg

Treatment Cycle Flow Diagram:

Pros

- Treatment residuals meet shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- The process is commercially available.
- Due to limited quantity of waste, availability should not be a great concern.
- Little or no release during normal operations, but release of tritium could occur in an accident.
- Process is specified BDAT and would be in full compliance with LDR standards without a variance.
- The process is well defined.

Cons

- Volume is increased by a factor greater than 2.
- Special precautions taken when Tritium is involved.
- Fixed by design and does not accept a range of inputs.
- Work force would be large for such a small volume of waste.
- All waste will be disposed of in HW/MW facilities.
- Stakeholder concerns with tritium release could be an issue.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because volume is increased by a factor greater than 2.
• secondary waste generation	40	Subtract 10 points from the median score of 50 because contaminated process equipment created.

Waste Stream Number & Name: SR-W014 Tritiated Mercury
Option Number: SR-W014-4
Facility: HW/MW-TB Treatment Technology Distill/Amalg
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all LDR standards are met.
• flexibility	20	Special precautions taken when Tritium is involved.
• ability to be shipped	80	Treatment residuals meet shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	70	The process is commercially available. Subtract 10 points from the median score of 80 because there are uncertainties arising from operation in a tritium environment.
• availability	80	Due to limited quantity of waste, availability should not be a great concern.
• scalability	20	Fixed by design and does not accept a range of inputs.
• remedial measures	50	Failure to amalgamate can be addressed by reprocessing with more reagents.
• schedule for treatment of waste	50	Due to technology uncertainties, confidence in a schedule would be low.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Little or no release during normal operations, but release of tritium could occur in an accident.
• non-operational worker potential exposure	40	Subtract 10 points from the median score of 50 because the decommissioning costs would be high for a waste stream of such small volume.
• operational worker potential exposure	20	Work force would be large for such a small volume of waste.
• transportation potential exposure	50	Transportation would be limited due to small volume of waste but will require characterization.
<i>Regulatory Parameters</i>		
• need for variance	80	Process is specified BDAT and would be in full compliance without a variance.
• ability to obtain a permit	70	Subtract 10 points from the median score of 80 because although the process is well defined, tritium in the mercury may cause concerns.
• waste disposal	20	All waste will be disposed of in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	20	Stakeholder concerns with tritium release could be an issue.
<i>Cost Considerations</i>		
• life cycle cost	47	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	20	Other DOE markets that have tritiated waste.
• private sector involvement	0	Subtract 20 points from the median score of 20 because no private sector companies have experience with tritium.

IDOA Score: Technical 44 Total 50

Waste Stream Number & Name: SR-W014 Tritiated Mercury

Option Number: SR-W014-4

Facility: HW/MW-TB

Treatment Technology Distill/Amalg

Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled

Module Location:

Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 226	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 902	
1.3.2 Safety Assurance Documentation	\$ 226	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 135	
TOTAL PRE-OPERATIONS		\$ 1763
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 1001	
2.2 Inspection	\$ 272	
2.3 Project Management	\$ 407	
2.4 Building Construction (inc. indirect)	\$ 3000	
2.5 Equipment (inc. indirect)	\$ 1550	
2.6 Construction Management	\$ 319	
2.7 Contingency	\$ 2339	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 8888
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 1500	
3.2 Annual Utilities	\$ 60	
3.3 Annual Materials	\$ 900	
3.4 Annual Maintenance	\$ 540	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 3000	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 750
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 3640	
4.2 Closure, Post-Closure, Monitoring	\$ 5	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 3645
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 100
SUB COST FOR DISTILL AND AMALG MODULE		\$ 15146
ESCALATION		1.23
TOTAL COST		\$ 18630

If above numbers do not appear to add correctly, it is the result of computer rounding.

Summary Page – Initial Screening

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment

Background Information

Failed or retired pumps used to pump tritium in the tritium production areas. Mercury was drained and poured from the pumps, but residual amounts still remain. Mercury is used as a pumping medium for the tritium gas. Lead may be present on some of the pumps as lead/tin solder on cooling coil construction or collars for shielding which are an integral part of the pumps.

Volume

- Current volume through 09/30/93 is 9.8 m³.
- Expected 1993-1997 volume will be 3.1 m³.

Waste Stream Composition

- Inorganic Debris

Waste Code

- D008A (TCLP Pb)
- D009A (TCLP Hg)

LDR Treatment Standard

- D008A-D009A – concentration based standards = 0.2-5.0 mg/l
- Alternative debris technology may be applied

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium because no analytical data collected due to ALARA concerns.

Radiological Characterization

- Tritium – estimate 500 Ci/pump
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Ashcrete	Ashcrete will not micro encapsulate Hg so that it passes TCLP.
CIF	Incineration	Incineration volatilizes Hg. CIF has no equipment to control Hg vapors.
ETF	Wastewater	ETF has no equipment to treat Hg contaminated equipment.
Lab.	Lab scale process flowsheet	Vitrification has no provision to control volatilize Hg.
LEFT	Wastewater	LEFT has no equipment to treat elemental Hg.
M-Area	Vitrification	Vitrifier has no provision to control volatilized Hg.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF	IDOA Scores		COST (x 1000)	PO
			Score	Tech.	Total		
SR-W015-1	Cont. Bldg.	S. S. Box	88	57	69	5492	√
SR-W015-2	HW/MW-TB	S. S. Box	94	56	65	13105	
SR-W015-3	Cont. Bldg.	Roast/Retort	51	45	51	19198	

Options Rejected Due To Low Technology Success Factor

- No options were rejected.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Mercury Contaminated Equipment waste streams is macroencapsulation as debris in a stainless steel box as a 90-day generator in the Tritium Facility. Existing inventory are in stainless steel boxes which meet the debris technology of macroencapsulation.

This option treats the constituent of concern, mercury, by isolating it from the environment in stainless steel boxes that have been welded shut.

This option is preferred because:

- It makes use of an existing facility that has the equipment installed to handle tritium gas.
- The waste satisfies the debris rule
- The process employs well known techniques (e.g., welding stainless steel).
- LDR standards are met.

Options Rejected During IDOA

Roasting and Retorting in a Containment Building

Roasting and retorting in a containment building was rejected because:

- The number of personnel needed to cut the contaminated equipment into pieces increased potential for personnel exposure to tritium and mercury.
- Option was not as cost effective as the preferred option.

Macroencapsulation in a Stainless Steel Box in a HW/MW-TB

Macroencapsulation in a stainless steel box in a HW/MW-TB was rejected because:

- This option is less cost effective than the preferred option.
- HW/MW-TB has no technological advantage over the preferred option.

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment
Option Number: SR-W015-1
Facility: Containment Building Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- Process satisfies requirements of the "debris rule" and all applicable LDR standards are met.
- Can process a wide range of materials.
- S. S. containers will meet current DOT shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- All processes involved are existing technology.
- Similar systems have demonstrated availability of >80%.
- The process failure does not produce altered waste form. A failed container is easily fixed.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.
- Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
- Exposure controlled by design. Number of workers is dependent upon throughput.
- Little secondary waste.

Cons

- All waste will require disposal in HW/MW facilities.
- Not a budget item, will require line item funding.

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment
Option Number: SR-W015-1
Facility: Containment Building Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because the volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met.
• flexibility	80	Can process a wide range of materials.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved are existing technology.
• availability	80	Similar systems have demonstrated availability of >80%.
• scalability	50	Throughput is set by design and not easily expanded except by adding additional shifts of operation.
• remedial measures	90	The process failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container is easily fixed.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	80	Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
• operational worker potential exposure	80	Exposure controlled by design. Number of workers is dependent upon throughput.
• transportation potential exposure	60	Add 10 points to the median score because no additional characterization needed. Waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process satisfies requirements of the "debris rule."
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	20	All waste will require disposal in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the waste form is not as permanent as vitrification.
<i>Cost Considerations</i>		
• life cycle cost	84	

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment
Option Number: SR-W015-1
Facility: Containment Building Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• funding availability	20	Not a budget item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because this is an existing technology.

IDOA Score: Technical 57 Total 69

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment
Option Number: SR-W015-1
Facility: Containment Building Treatment Technology S. S. Box
Cost Estimate Sheet

INCLUDES COSTS FOR OPTION SR-W041C-1

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 56	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 224	
1.3.2 Safety Assurance Documentation	\$ 56	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 656
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 242	
2.2 Inspection	\$ 74	
2.3 Project Management	\$ 119	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 100	
2.6 Construction Management	\$ 77	
2.7 Contingency	\$ 580	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2192
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 225	
3.2 Annual Utilities	\$ 9	
3.3 Annual Materials	\$ 135	
3.4 Annual Maintenance	\$ 81	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 450	
X NUMBER OF YEARS OF OPERATION	1.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 450
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 880	
4.2 Closure, Post-Closure, Monitoring	\$ 8	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 888
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 150
SUB COST FOR MACROENCAPSULATION MODULE		\$ 4335
ESCALATION		1.267
TOTAL COST		\$ 5492

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment
Option Number: SR-W015-2
Facility: HW/MW-TB Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- Process satisfies requirements of the "debris rule" and all applicable LDR standards are met.
- Can process a wide range of materials.
- S. S. containers will meet current DOT shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- All processes involved are existing technology.
- Similar systems have demonstrated availability of >80%.
- Process failure does not produce altered waste form. A failed container is easily fixed.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.
- Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
- Exposure controlled by design and < average number of workers. Low potential for exposure.
- Little secondary waste.

Cons

- All waste will require disposal in HW/MW facilities.
- Public concern should be limited due to the simplicity of the process, but the waste form is not permanent as some.
- Not a budget item, will require line item funding.

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment
Option Number: SR-W015-2
Facility: HW/MW-TB Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met.
• flexibility	80	Can process a wide range of materials.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved are existing technology.
• availability	80	Similar systems have demonstrated availability of >80%.
• scalability	50	Throughput is set by design and not easily expanded except by adding additional shifts of operation.
• remedial measures	90	Process failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container is easily fixed.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	80	Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
• operational worker potential exposure	80	Exposure controlled by design and < average number of workers. Low potential for exposure.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process satisfies requirements of the "debris rule."
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	20	All waste will require disposal in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the waste form is not as permanent as vitrification.
<i>Cost Considerations</i>		
• life cycle cost	63	

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment
Option Number: SR-W015-2
Facility: HW/MW-TB Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• funding availability	20	Not a budget item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because this is an existing technology.

IDOA Score: Technical 56 Total 65

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment
Option Number: SR-W015-2
Facility: HW/MW-TB Treatment Technology S. S. Box
Cost Estimate Sheet

INCLUDES COSTS FOR OPTION SR-W041C-2

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 159	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 634	
1.3.2 Safety Assurance Documentation	\$ 159	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 135	
TOTAL PRE-OPERATIONS		\$ 1361
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 682	
2.2 Inspection	\$ 214	
2.3 Project Management	\$ 349	
2.4 Building Construction (inc. indirect)	\$ 3000	
2.5 Equipment (inc. indirect)	\$ 100	
2.6 Construction Management	\$ 217	
2.7 Contingency	\$ 1644	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 6206
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 225	
3.2 Annual Utilities	\$ 9	
3.3 Annual Materials	\$ 135	
3.4 Annual Maintenance	\$ 81	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 450	
X NUMBER OF YEARS OF OPERATION	1.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 450
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 2480	
4.2 Closure, Post-Closure, Monitoring	\$ 8	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 2488
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 150
SUB COST FOR MACROENCAPSULATION MODULE		\$ 10655
ESCALATION		1.23
TOTAL COST		\$ 13105

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment
Option Number: SR-W015-3
Facility: Containment Building Treatment Technology Roast/Retort

Treatment Cycle Flow Diagram:

Pros

- Roast and retort is the specified technology for Hg recovery. The process will meet LDR standards.
- Straightforward processing can handle a wide variety of equipment contaminated with Hg.
- Process will treat all residuals so that they can be shipped without further treatment.
- Final waste form will meet WAC without additional treatment.
- Few moving parts indicate that the process will have an availability of 80%.
- Equipment that contain Hg after treatment can be rerun.
- Part of process for S. S. Boxes satisfies requirements for "debris rules."
- As roast and retort is the specified technology, little difficulty obtaining a permit is expected.

Cons

- The step to cut up the pump will limit the throughput.
- The number of operational workers will be greater than other comparable tritium processes, owing to the need to cut the equipment up manually.
- Not a budgeted item, will require line item funding.

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment
Option Number: SR-W015-3
Facility: Containment Building Treatment Technology Roast/Retort
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because waste volume about the same after processing, secondary waste volume.
• secondary waste generation	50	Secondary waste liquid Hg must be treated.
• destruction removal and demobilization efficiency	80	Roast and retort is the specified technology for Hg recovery. The process will meet LDR standards.
• flexibility	80	Straightforward processing can handle a wide variety of equipment contaminated with Hg.
• ability to be shipped	80	Process will treat all residuals so that they can be shipped without further treatment.
• final waste form	80	Roast and retort is the specified technology for recovery of Hg equipment. Final waste form will meet WAC without additional treatment.
<i>Engineering Parameters</i>		
• system implementability	50	Some parts of the roast and retort process have not been proven at plant scale.
• availability	80	Few moving parts indicate that the process will have an availability of 80%.
• scalability	20	Fixed by design. The step to cut up the pump will limit the throughput.
• remedial measures	80	Equipment that contain Hg after treatment can be rerun.
• schedule for treatment of waste	50	Technology and design issues result in some uncertainties about the schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	50	Unpacking and cutting the equipment apart has the potential for a significant release under some accident scenarios.
• non-operational worker potential exposure	50	The number of non-operational workers will be approximately the same as other comparable tritium processes.
• operational worker potential exposure	20	The number of operational workers will be greater than other comparable tritium processes, owing to the need to cut the equipment up manually.
• transportation potential exposure	50	Limited transportation of waste form after treatment. Little or no additional characterization required.
<i>Regulatory Parameters</i>		
• need for variance	80	Part of process for S. S. Boxes satisfies requirements for "debris rules."
• ability to obtain a permit	80	As roast and retort is the specified technology, little difficulty obtaining a permit is expected.
• waste disposal	20	Most wastes will require disposal in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	30	Public will be concerned because roast and retort may be the specified technology. Subtract 20 points from the median score of 50 because the largest volume of waste will not be as permanent a waste form as some.
<i>Cost Considerations</i>		
• life cycle cost	45	

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment
Option Number: SR-W015-3
Facility: Containment Building Treatment Technology Roast/Retort
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	50	Other DOE sites have similar waste streams.
• private sector involvement	0	Subtract 20 points from the median score of 20 because no vendors have expressed an interest in treating this waste stream.

IDOA Score: Technical 45 Total 51

Waste Stream Number & Name: SR-W015 Mercury Contaminated Equipment
Option Number: SR-W015-3
Facility: Containment Building Treatment Technology Roast/Retort
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled

Module Location: _____

Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 201	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 804	
1.3.2 Safety Assurance Documentation	\$ 201	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 90	
TOTAL PRE-OPERATIONS		\$ 1572
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 909	
2.2 Inspection	\$ 225	
2.3 Project Management	\$ 315	
2.4 Building Construction (inc. indirect)	\$ 2000	
2.5 Equipment (inc. indirect)	\$ 2130	
2.6 Construction Management	\$ 289	
2.7 Contingency	\$ 2085	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 7953
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 216	
3.2 Annual Utilities	\$ 9	
3.3 Annual Materials	\$ 129	
3.4 Annual Maintenance	\$ 78	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 431	
X NUMBER OF YEARS OF OPERATION	4.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 1725
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 3304	
4.2 Closure, Post-Closure, Monitoring	\$ 8	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 3312
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 150
SUB COST FOR ROAST AND RETORT MODULE		\$ 14711
ESCALATION		1.305
TOTAL COST		\$ 19198

If above numbers do not appear to add correctly, it is the result of computer rounding.

Summary Page

Waste Stream Number & Name: SR-W016 221-F Canyon High Level Liquid Waste (HLW)

Background Information

This waste is an aqueous liquid with fission products generated from the 221-F Canyon facility in support of the PUREX Process. F-Canyon waste materials are generated from the extraction of plutonium from reactor targets and other feed stock.

Volume

- Current volume through 09/30/93 is 54,160 m³.
- Expected 1993-1997 volume will be 7350 m³.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D002C (corrosive high-level waste), D005B (high-level waste Ba), D007B (high-level waste Cr), D008D (high-level waste Pb), D009F (high-level waste Hg), D011B (high-level waste Ag)
- nonwastewater slurry

LDR Treatment Standard

- Specified technology = Vitrification of high level mixed radioactive wastes

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based on availability of analysis, with the exception of TCLP.

Radiological Characterization

- Total activity for radiological characterization is 6.81 Ci/gal.
- Alpha emitter (U²³⁵, U²³⁸, Pu²³⁹, Pu²⁴⁰, Pu²⁴¹, Am²⁴¹, Cm²⁴¹) and beta/gamma emitter (Sr⁹⁰, Ru¹⁰⁶, Zr⁹⁵, Nb⁹⁵, Rh¹⁰⁶, Cs¹³⁷, Ce¹⁴⁴, Pr¹⁴⁴, Pm¹⁴⁷, H³).
- Waste is remote handled.
- High-level waste.

Preferred Option

The preferred treatment option for 221-F Canyon High Level Liquid Waste is High-Level Waste Vitrification in the Defense Waste Processing Facility (DWPF).

Treatment Justification

In-depth options analysis is not required for this waste stream since a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

The principle objective in the treatment of the high-level waste sludge, the high-level waste precipitate, and the low-level waste salt solution was to effectively isolate the waste in a suitable matrix. If the toxic characteristics of the low and high-level waste streams do not leach out of the treatment matrix above the regulatory limit, then the wastes are considered nonhazardous and meet the Land Disposal Restriction treatment standard. After the examination of numerous waste forms from treatment, the Savannah River Technology Center determined that borosilicate glass would be the best matrix for the high-level waste sludge and precipitate because it was capable of meeting the treatment standard while creating the most stable and long lived waste form. Similar studies resulted in a determination that saltstone, a cementitious grout, should be chosen for the low-level waste salt solution treatment alternative because it too created a stable, long lived waste form that met the regulatory treatment standard for the waste stream.

For a more detailed account of the technical justification for the technology chosen for high-level waste treatment, please refer to Section 2 and 3 of the Final Environmental Impact Statement (February 1982, DOE/EIS-0082, UC-70) for the Defense Waste Processing Facility.

Waste Stream Number & Name: SR-W016 221-F Canyon High Level Liquid Waste
Facility: DWPF (HLW)
Cost Estimate Sheet Treatment Technology Vitrification

Waste Type: ☐ MLLW ☒ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☐ contact handled ☒ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 35,200 (2)	
1.2 Demonstration Costs	\$ 27,210 (2)	
1.3 Operations Budget Funded Activities	196,025 (2)	
TOTAL PRE-OPERATIONS		\$ 258,435 (1)
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 51,105 (3)	
2.2 Inspection	\$ 6,814 (3)	
2.3 Project Management	\$ 17,035 (3)	
2.4 Building Construction (inc. indirect)	\$ 22,455 (3)	
2.5 Equipment (inc. indirect)	\$ 148,200 (4)	
2.6 Construction Management	\$ 10,221 (3)	
2.7 Contingency	\$ 34,070 (3)	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 488,900 (1)
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 95,022 (5)	
3.2 Annual Utilities	\$ 13,604 (6)	
3.3 Annual Materials	\$ 9,823 (6)	
3.4 Annual Maintenance	\$ 19,256 (6)	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 137,705	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ TBD
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ TBD	
4.2 Closure, Post-Closure, Monitoring	\$ TBD	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ TBD
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$ N/A
6.0 Offsite Treatment (DOE)		\$ N/A
7.0 Transportation		\$
8.0 Disposal		\$ 1,375,000(1,7)
SUB COST FOR MODULE		\$
ESCALATION		1,126
TOTAL COST		\$ TBD

- 1 - These estimates are provided for cost comparisons only and do not represent any agreements on budgets for the DWPF or Saltstone facilities. DWPF budgets are currently under revision.
2 - Fourth Quarter FY94 and FY95 expenses. Also includes some SRTC costs for FY96.
3 - These estimates are based on an assumed distribution of project costs: Design 15%, Inspection 2%, Project Management 5%, Building Construction 65%, Construction Management 3%, Contingency 10% of project costs.
4 - Includes 6 replacement melters and 8 disposal boxes.
5 - FY95 AOP Interim Data Feed 8/4/94.
6 - FY94 AOP
7 - Ref. FY93 SRS Waste Cost Analysis (U) WSRC-RP-93-942, Rev. 1 XI.B.3 Offsite Treatment: Disposal
General Note: These estimates of costs include both applicable waste streams (SR-W016 and SR-W017).

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Summary Page

Waste Stream Number & Name: SR-W017 221-H Canyon High Level Liquid Waste (HLW)

Background Information

This waste stream is an aqueous liquid containing mixed fission products from the H-Canyon facility in support of the modified PUREX process. The stream also contains decontamination solution from maintenance activities in the H-Area High-Level Waste Tank Farm. H-Canyon waste materials are generated from the recovery of enriched uranium from fuel tubes.

Volume

- Current volume through 09/30/93 is 74,180 m³.
- Expected 1993-1997 volume will be 6,220 m³.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D002C (corrosive high-level waste), D005B (high-level waste Ba), D007B (high-level waste Cr), D008D (high-level waste Pb), D009F (high-level waste Hg), D011B (high-level waste Ag)
- nonwastewater slurry

LDR Treatment Standard

- specified technology = Vitrification of high level mixed radioactive wastes

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based on availability of analysis, with the exceptions of TCLP.

Radiological Characterization

- Total activity for radiological characterization is 37.8 Ci/gal.
- Alpha emitters (U²³⁵, U²³⁸, Pu²³⁹, Pu²⁴⁰, Pu²⁴¹, Am²⁴¹, Cm²⁴¹) and beta/gamma emitter (Sr⁹⁰, Ru¹⁰⁶, Zr⁹⁵, Nb⁹⁵, Rh¹⁰⁶, Cs¹³⁷, Ce¹⁴⁴, Pr¹⁴⁴, Pm¹⁴⁷, H³).
- Waste is remote handled.
- High-level waste

Preferred Option

The preferred treatment option for 221-H Canyon High Level Liquid Waste is High Level Vitrification in the Defense Waste Processing Facility (DWPF).

Treatment Justification

In-depth options analysis is not required for this waste stream since a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

The principle objective in the treatment of the high-level waste sludge, the high-level waste precipitate, and the low-level waste salt solution was to effectively isolate the waste in a suitable matrix. If the toxic characteristics of the low and high-level waste streams do not leach out of the treatment matrix above the regulatory limit, then the wastes are considered nonhazardous and meet the Land Disposal Restriction treatment standard. After the examination of numerous waste forms from treatment, the Savannah River Technology Center determined that borosilicate glass would be the best matrix for the high-level waste sludge and precipitate because it was capable of meeting the treatment standard while creating the most stable and long lived waste form. Similar studies resulted in a

determination that saltstone, a cementitious grout, should be chosen for the low-level waste salt solution treatment alternative because it, too, created a stable, long lived waste form that met the regulatory treatment standard for the waste stream.

For a more detailed account of the technical justification for the technology chosen for high-level waste treatment, please refer to Section 2 and 3 of the Final Environmental Impact Statement (February 1982, DOE/EIS-0082, UC-70) for the Defense Waste Processing Facility.

**Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE
STREAM SR-W016. SEE COST ESTIMATE SHEET FOR SR-W016.**

Summary Page – Initial Screening

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls

Background Information

This waste consists of "tyvek" filter paper contaminated with residual filter cake and filter media from the filtering of M-Area metal plating sludges (F006 waste). No cyanide, lead, silver, chromium or cadmium were used in the plating line operation. The rolls are six feet long and two feet in diameter.

Volume

- Current volume through 09/30/93 is 257 m³.
- Expected 1993-1997 volume will be 5.0 m³.

Waste Stream Composition

- Organic Debris

Waste Code

- F006 (metal plating line waste, without cyanide)

LDR Treatment Standard

- Concentration based standard = 0.066-5.2 mg/l

Waste Characterization

- Process knowledge and sampling and analysis used to characterize the waste.
- Confidence level high due to availability of sample results and knowledge the process generates listed waste.
- Primary contaminant is Ni. Others included are Cd, Cr, Pb, and Ag.

Radiological Characterization

- Total activity 0.0173 Ci/kg.
- Alpha emitters are U²³⁴, U²³⁵, and U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
ETF	Wastewater	ETF has no equipment to treat this waste.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
LETf	Wastewater	LETf has no equipment to treat this waste.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF	IDOA Scores		COST (x 1000)	PO
			Score	Tech.	Total		
SR-W018-1	CIF	Incineration	94	60	71	6624	√
SR-W018-2	M-Area	Vitrification	75	57	70	3862	
SR-W018-3	Cont. Bldg.	S. S. Box	100	58	66	16017	
SR-W018-4	HW/MW-TB	S. S. Box	100	57	63	18570	
SR-W018-5	CIF	Ashcrete	88	55	62	15522	
SR-W018-6	INEL/WEDF	Stabilization	*	51	63	4211	
SR-W018-7	Vendor	Plasma Hearth	1				

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

Plasma Hearth Process by Vendor

Plasma hearth process by vendor was rejected because:

- Plasma hearth incineration is currently still in the laboratory. While prototypes may exist, they have no record of continuous reliable operation in industrial settings. Hence, $P_m=0.9$.
- Control of the process requires sophisticated computerized instrumentation. Hence, $P_c=0.9$.
- It is not expected for this technology to reach a level of reliability suitable for industrial application for 5-10 years.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Filter Paper Take Up Rolls waste stream is pretreatment by cutting or shredding, Incineration followed by stabilization in the Consolidated Incineration Facility.

This option treats the constituent of concern, plating line waste, by converting the combustible fraction of the filter paper rolls to carbon dioxide, and water, and stabilizing the metal-containing ash with cement.

This option is preferred because:

- Waste volume will be reduced by a factor of at least 2.
- Final waste form will meet LDR standards.
- Incineration and ash stabilization are demonstrated technologies.
- CIF is currently under construction.
- Residual solids are stabilized with cement.
- It is a cost effective option.

Treatability Study Requirements

The impact of incinerating filter paper rolls on the ashcrete and blowcrete systems must be assessed. The ashcrete impact study will be conducted on a laboratory scale and consist of:

- Incinerating a sample of the filter paper to obtain a sample of ash
- Measuring the volume of the ash

- Mixing the ash with cement and other additives as needed to form ashcrete
- Monitoring the set up of the ashcrete
- Testing the sample to determine that it met LDR standards

Impact on the stabilized blowdown liquid (Blowcrete) will be determined by studying the existing analysis of the filter paper waste to identify any unique constituents that might partition to the blowdown. If any such constituents are identified, the impact on the blowcrete will be tested by:

- Formulating a simulant blowdown liquid
- Mixing the simulant with cement and other additives as needed to form blowcrete
- Monitoring the set up of the blowcrete
- Testing the sample to determine that it met LDR standards

Options Rejected During IDOA

Ashcrete Stabilization at CIF

Ashcrete Stabilization at CIF was rejected because:

- Waste volume more than doubles.
- Final waste form requires disposal in HW/MW facility.

Vitrification by M-Area Vendor Treatment Process

Vitrification by M-Area Vendor Treatment Process was rejected because:

- Extensive treatability studies will be required to confirm viability of treatment method.
- Uncertainties exist about vitrifier's capability of handling large chunks of material added directly to the melt pool.

Macroencapsulation in Stainless Steel Boxes (either in a Containment Building or in HW/MW-TB)

Macroencapsulation in stainless steel boxes (either in a containment building or in HW/MW-TB) was rejected because:

- Waste volume more than doubles.
- Final waste form requires disposal in HW/MW facility.

Stabilization at INEL/WEDF

Stabilization at INEL/WEDF (encapsulating the waste with a grout matrix) was rejected because:

- Waste volume more than doubles.
- Final waste form requires disposal in HW/MW facility.

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls

Option Number: SR-W018-1

Facility: CIF

Treatment Technology Incineration

Treatment Cycle Flow Diagram:

Pros

- Expect at least 2:1 volume reduction.
- The waste stream is expected to meet all applicable LDR standards after treatment by this facility.
- Incinerator designed for a wide range of wastes with some operational limitations.
- Waste required no additional treatment to meet shipping requirements.
- Incineration is a current demonstrated technology, and all elements and processes have been previously demonstrated.
- The presence of metals in the secondary wastes might require rework, but process failure should not create a waste that cannot be treated by existing technologies.
- Reasonably easy to schedule this waste stream assuming current startup schedule.
- Most of the additional metals in this waste stream will be captured in the ashcrete. Resulting in little or no emissions even in most accidents.
- No increase in non operational workers is required to treat this waste, but increase in non-routine maintenance will be required.
- No impact due to this waste stream. No impact because there is no increase in exposure potential and no additional workers are required.
- Processes are in full compliance with all applicable regulations and no variance needed.
- This waste is part of the basis for permitting, meeting treatment standards is required for the final waste form.
- Line item is funded.
- This is purchased technology.

Cons

- 100% of the final waste form will go to the HW/MW Vaults.
- The public has limited acceptance of treatment involving incineration.

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	70	Subtract 10 points from the median score of 80 because expect at least 2:1 volume reduction.
• secondary waste generation	50	Significant volume of secondary waste due to non-combustible sludge and it can be handled by an existing technology.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because the waste stream is expected to meet all applicable LDR standards after treatment by this facility.
• flexibility	80	Incinerator designed for a wide range of wastes with some operational limitations.
• ability to be shipped	80	Waste required no additional treatment to meet shipping requirements.
• final waste form	80	Final waste form meets the expected WAC upon exit from the process.
<i>Engineering Parameters</i>		
• system implementability	100	Incineration is a current demonstrated technology. Add 20 points to the median score of 80 because all elements and processes have been previously demonstrated.
• availability	50	Incinerator availability for solids is 50%. Normal maintenance requirements apply.
• scalability	50	Process can accept a range of input but capacity is set by design. Excess capacity does exist at this point.
• remedial measures	70	The presence of metals in the secondary wastes might require rework. Subtract 10 points from the median score of 80 because process failure should not create a waste that cannot be treated by existing technologies.
• schedule for treatment of waste	80	Reasonably easy to schedule this waste stream assuming current startup schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Most of the additional metals in this waste stream will be captured in the ashcrete. Resulting in little or no emissions even in most accidents.
• non-operational worker potential exposure	70	No increase in non operational workers is required to treat this waste. Subtract 10 points from the median score of 80 because increase in non-routine maintenance will be required.
• operational worker potential exposure	80	No impact due to this waste stream. No impact because there is no increase in exposure potential and no additional workers are required.
• transportation potential exposure	50	Requires transportation, but limited additional characterization required to support transportation.
<i>Regulatory Parameters</i>		
• need for variance	80	Processes are in full compliance with all applicable regulations and no variance needed.
• ability to obtain a permit	80	This waste is part of the basis for permitting, meeting treatment standards is required for the final waste form.
• waste disposal	20	100% of the final waste form will go to the HW/MW Vaults.

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Public Acceptance</i>		
• public acceptance	20	The public has limited acceptance of treatment involving incineration.
<i>Cost Considerations</i>		
• life cycle cost	81	
• funding availability	80	Line item is funded.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is purchased technology.
• private sector involvement	100	Add 20 points to the median score of 80 because this is purchased technology.

IDOA Score: Technical 60 Total 71

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-1
Facility: CIF Treatment Technology Incineration
Cost Estimate Sheet

INCLUDES COST OF OPTION SR-W028-1

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 65	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 261	
1.3.2 Safety Assurance Documentation	\$ 65	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 586
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 286	
2.2 Inspection	\$ 82	
2.3 Project Management	\$ 127	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 300	
2.6 Construction Management	\$ 91	
2.7 Contingency	\$ 676	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2562
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 141	
3.2 Annual Utilities	\$ 6	
3.3 Annual Materials	\$ 84	
3.4 Annual Maintenance	\$ 51	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 281	
X NUMBER OF YEARS OF OPERATION	4.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 1125
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 5	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 5
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 100
SUB COST FOR INCINERATOR MODULE		\$ 4378
ESCALATION		1.513
TOTAL COST		\$ 6624

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls

Option Number: SR-W018-2

Facility: M-Area

Treatment Technology Vitrification

Treatment Cycle Flow Diagram:

Pros

- Volume reduction >5:1.
- All applicable LDR treatment standards are met and if waste is delisted (F006), final waste will be non-hazardous.
- Will meet all shipping requirements.
- Final vitrified waste form will meet disposal requirements. No additional treatment required.
- An alternative study shows equipment is available for cutting rolls. A pilot scale demonstration has been successful.
- Failed waste forms can easily be recycled.
- Schedule easily developed.
- This is not different from waste currently scheduled for treatment here. Emissions are few and controlled even in accident scenarios.
- Process will be in full compliance. Waste is similar to existing permitted waste.

Cons

- Throughput fixed by design.
- Not budgeted.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	90	Add 10 points to the median score of 80 because volume reduction >5:1.
• secondary waste generation	50	Some secondary waste in the form of a sludge will require further treatment by existing technology.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR treatment standards are met and if waste is delisted (F006), final waste will be non-hazardous.
• flexibility	80	Vitrification technology can handle a wide variety of wastes without extensive adjustments in operating parameters.
• ability to be shipped	80	Will meet all shipping requirements.
• final waste form	100	Final vitrified waste form will meet disposal requirements. Add 20 points to the median score of 80 because no additional treatment required.

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-2
Facility: M-Area Treatment Technology Vitrification
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	80	An alternative study shows equipment is available for cutting rolls. A pilot scale demonstration has been successful.
• availability	50	Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curle load.
• scalability	20	Throughput fixed by design.
• remedial measures	80	Recoverable. Recycle through melter.
• schedule for treatment of waste	80	Schedule easily developed.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	90	This is not different from waste currently scheduled for treatment here. Add 10 points to the median score of 80 because emissions are few and controlled even in accident scenarios.
• non-operational worker potential exposure	50	Additional non-routine maintenance required.
• operational worker potential exposure	40	Size reduction and repackaging of waste will require extensive handling. Subtract 10 points from median score of 50 because of concerns about manual size reduction.
• transportation potential exposure	50	Nothing unusual about waste form. Expect low alpha and no liquids.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be in full compliance. Waste is similar to existing permitted waste.
• ability to obtain a permit	50	Permit would exist though some modifications might be required.
• waste disposal	50	Assume blending with current stream.
<i>Public Acceptance</i>		
• public acceptance	50	Public has supported treatment that results in a glass waste form.
<i>Cost Considerations</i>		
• life cycle cost	89	
• funding availability	20	Not budgeted.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 57 Total 70

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-2
Facility: M-Area Treatment Technology Vitrification
Cost Estimate Sheet

INCLUDES COST OF OPTIONS SR-W028-2

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 44	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 174	
1.3.2 Safety Assurance Documentation	\$ 44	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 5	
TOTAL PRE-OPERATIONS		\$ 541
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 205	
2.2 Inspection	\$ 40	
2.3 Project Management	\$ 45	
2.4 Building Construction (inc. indirect)	\$ 100	
2.5 Equipment (inc. indirect)	\$ 800	
2.6 Construction Management	\$ 65	
2.7 Contingency	\$ 451	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 1706
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 9	
3.2 Annual Utilities	\$ 0	
3.3 Annual Materials	\$ 6	
3.4 Annual Maintenance	\$ 3	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 19	
X NUMBER OF YEARS OF OPERATION	8.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 150
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 3	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 3
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 30	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 50
SUB COST FOR VITRIFICATION MODULE		\$ 2479
ESCALATION		1.556
TOTAL COST		\$ 3862

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls (FPTUR)
Option Number: SR-W018-3
Facility: Containment Building Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- Process satisfies requirements of the "debris rule" and all applicable LDR standards are met.
- Can process a wide range of materials.
- S. S. containers will meet current DOT shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- All processes involved are existing technology.
- Similar systems have demonstrated availability of >80%.
- Process failure does not produce altered waste form. A failed container is easily fixed.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.
- Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
- Exposure controlled by design. Number of workers is dependent upon throughput.
- Little secondary waste.

Cons

- All waste will require disposal in HW/MW facilities.
- Not a budget item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met.
• flexibility	80	Can process a wide range of materials.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved are existing technology.
• availability	80	Similar systems have demonstrated availability of >80%.
• scalability	50	Throughput is set by design and not easily expanded except by adding additional shifts of operation.

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls (FPTUR)
Option Number: SR-W018-3
Facility: Containment Building Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• remedial measures	90	Process failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container is easily fixed.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	80	Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
• operational worker potential exposure	80	Exposure controlled by design. Number of workers is dependent upon throughput.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process satisfies requirements of the "debris rule."
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	20	All waste will require disposal in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the wasteform is not unalterably inert.
<i>Cost Considerations</i>		
• life cycle cost	54	
• funding availability	20	Not a budget item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because this is an existing technology.

IDOA Score: Technical 58 Total 66

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-3
Facility: Containment Building Treatment Technology S. S. Box
Cost Estimate Sheet

INCLUDES COST OF OPTIONS SR-W028-4 AND SR-W051-4

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 58	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 233	
1.3.2 Safety Assurance Documentation	\$ 58	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 669
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 253	
2.2 Inspection	\$ 76	
2.3 Project Management	\$ 121	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 150	
2.6 Construction Management	\$ 81	
2.7 Contingency	\$ 604	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2284
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 788	
3.2 Annual Utilities	\$ 32	
3.3 Annual Materials	\$ 473	
3.4 Annual Maintenance	\$ 284	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 1575	
X NUMBER OF YEARS OF OPERATION	4.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 6300
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 920	
4.2 Closure, Post-Closure, Monitoring	\$ 100	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1020
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 2000
SUB COST FOR MACROENCAPSULATION MODULE		\$ 12274
ESCALATION		1.305
TOTAL COST		\$ 16017

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-4
Facility: HW/MW-TB Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- All applicable LDR standards are met.
- Can process a wide range of materials.
- S. S. containers will meet current DOT shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- All processes involved are existing technology.
- Similar systems have demonstrated availability of <80%.
- The process failure does not produce altered waste form. A failed container is easily fixed.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.
- Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
- Exposure controlled by design. Number of workers is dependent upon throughput.
- Process satisfies requirements of the "debris rule."

Cons

- All waste will require disposal in HW/MW facilities.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	50	Initial container will require disposal.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met.
• flexibility	80	Can process a wide range of materials.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved are existing technology.
• availability	80	Similar systems have demonstrated availability of >80%.
• scalability	50	Throughput is set by design and not easily expanded except by adding additional shifts of operation.

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls

Option Number: SR-W018-4

Facility: HW/MW-TB

Treatment Technology S. S. Box

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• remedial measures	90	The process failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container is easily fixed.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	80	Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
• operational worker potential exposure	80	Exposure controlled by design. Number of workers is dependent upon throughput.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process satisfies requirements of the "debris rule."
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	20	All waste will require disposal in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the wasteform is not unalterably inert.
<i>Cost Considerations</i>		
• life cycle cost	47	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because this is an existing technology.

IDOA Score: Technical 57 Total 63

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-4
Facility: HW/MW-TB Treatment Technology S. S. Box
Cost Estimate Sheet

INCLUDES COST OF OPTIONS SR-W028-5 AND SR-W051-3

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 58	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 233	
1.3.2 Safety Assurance Documentation	\$ 58	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 669
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 253	
2.2 Inspection	\$ 76	
2.3 Project Management	\$ 121	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 150	
2.6 Construction Management	\$ 81	
2.7 Contingency	\$ 604	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2284
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 788	
3.2 Annual Utilities	\$ 32	
3.3 Annual Materials	\$ 473	
3.4 Annual Maintenance	\$ 284	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 1575	
X NUMBER OF YEARS OF OPERATION	4.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 6300
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 920	
4.2 Closure, Post-Closure, Monitoring	\$ 100	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1020
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 2000
SUB COST FOR MARCO ENCAPSULATION MODULE		\$ 12274
ESCALATION		1.513
TOTAL COST		\$ 18570

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-5
Facility: CIF

Treatment Technology Ashcrete

Treatment Cycle Flow Diagram:

Pros

- No secondary waste produced by Ashcrete.
- The waste stream is expected to meet all applicable LDR standards after this treatment.
- The waste form meets the expected WAC. Waste form suitable for disposal in the form it exits the process.
- Ashcrete is a current demonstrated technology and a proven technology.
- Process failure should not create a waste form that can not be treated by existing technologies.
- Reasonably easy to schedule this waste stream assuming current startup schedule.
- The metals in this waste stream will be captured in the ashcrete. Very little emissions resulting in little or no emissions even during accidents.
- Well accepted waste form. No variance needed.
- Line item is funded.

Cons

- Expected to increase volume by factor of 3.
- 100% of the final waste form will go to the HW/MW Vaults.
- Waste form is not as permanent as other forms of stabilization.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because expected to increase volume by factor of 3.
• secondary waste generation	100	Add 20 points to the median score of 80 because no secondary waste produced by Ashcrete.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because the waste stream is expected to meet all applicable LDR standards after this treatment.
• flexibility	50	Putting waste streams directly in ashcrete and bypassing the incineration process lowers efficiency.
• ability to be shipped	50	Waste form may require additional characterization to determine that it satisfies shipping requirements.
• final waste form	100	The waste form meets the expected WAC. Add 20 points to the median score of 80 because waste form suitable for disposal in the form it exits the process.

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-5
Facility: CIF Treatment Technology Ashcrete
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
Engineering Parameters		
• system implementability	100	Add 20 points to the median score of 80 because ashcrete is a current demonstrated technology and a proven technology.
• availability	50	Normal maintenance requirements apply. This waste stream may require a "clean out" earlier than anticipated based on curie load.
• scalability	50	Limited excess capacity exists because it is set by design.
• remedial measures	70	The presence of metals in the final waste form might require rework. Subtract 10 points from the median score of 80 because a process failure should not create a waste form that can not be treated by existing technologies.
• schedule for treatment of waste	80	Reasonably easy to schedule this waste stream assuming current startup schedule.
Personnel Parameters		
• consequence of unmitigated accident scenarios	80	The metals in this waste stream will be captured in the ashcrete. Very little emissions resulting in little or no emissions even during accidents.
• non-operational worker potential exposure	70	Subtract 10 points from the median score of 80 because additional non-routine maintenance required.
• operational worker potential exposure	50	Increased operator handling due to this waste stream so the potential for exposure is increased.
• transportation potential exposure	50	Does not require additional characterization to support transportation and limited number of waste transports required.
Regulatory Parameters		
• need for variance	80	Well accepted waste form. No variance needed.
• ability to obtain a permit	50	Modification required to facilities existing permit, but final waste must meet LDR treatment standards.
• waste disposal	20	100% of the final waste form will go to the HW/MW disposal.
Public Acceptance		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization.
Cost Considerations		
• life cycle cost	56	
• funding availability	80	Line item is funded.
Industry Involvement		
• market for technology	0	Incinerator purchased from a vendor. Incineration is common technology. Subtract 20 points for median score of 20 because DOE has nothing new to market.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing technology.

IDOA Score: Technical 55 Total 62

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-5
Facility: CIF Treatment Technology Ashcrete
Cost Estimate Sheet

INCLUDES COST OF OPTION SR-W028-3

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 65	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 261	
1.3.2 Safety Assurance Documentation	\$ 65	
1.3.3 Permitting	\$ 1500	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 2086
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 286	
2.2 Inspection	\$ 82	
2.3 Project Management	\$ 127	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 300	
2.6 Construction Management	\$ 91	
2.7 Contingency	\$ 676	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2562
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 63	
3.2 Annual Utilities	\$ 3	
3.3 Annual Materials	\$ 38	
3.4 Annual Maintenance	\$ 23	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 125	
X NUMBER OF YEARS OF OPERATION	9.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 1125
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 1040	
4.2 Closure, Post-Closure, Monitoring	\$ 150	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1190
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 3000
SUB COST FOR ASHCRETE STABILIZATION MODULE		\$ 9963
ESCALATION		1.558
TOTAL COST		\$ 15522

If above numbers do not appear to add correctly, It is the result of computer rounding.

Waste Stream Number & Name: SR-W018 **Filter Paper Take Up Rolls**
Option Number: SR-W018-6
Facility: INEL/WEDF **Treatment Technology** Stabilization

Treatment Technology

The INEL WEDF Stabilization process provides treatments for aqueous and organic liquids and debris. The process stabilizes waste in a grout matrix to reduce leachability.

Pros

- No secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	No secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-6
Facility: INEL/WEDF Treatment Technology Stabilization
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon state approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B application permit prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the states acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	88	
• funding availability	50	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 63

Waste Stream Number & Name: SR-W018 Filter Paper Take Up Rolls
Option Number: SR-W018-6
Facility: INEL/WEDF
Cost Estimate Sheet

Treatment Technology Stabilization

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled

Module Location: INEL

Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element		(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0	Pre-Operations		
1.1	Studies and Bench Scale Tests	\$ N/A	
1.2	Demonstration Costs	\$ N/A	
1.3	Operations Budget Funded Activities		
1.3.1	Conceptual Design	\$ N/A	
1.3.2	Safety Assurance Documentation	\$ N/A	
1.3.3	Permitting	\$ N/A	
1.3.4	Preparation for Operations	\$ N/A	
1.3.5	Project Management	\$ N/A	
	TOTAL PRE-OPERATIONS		\$ N/A
2.0	Facility Construction Cost		
2.1	Design (Title I and II)	\$ N/A	
2.2	Inspection	\$ N/A	
2.3	Project Management	\$ N/A	
2.4	Building Construction (inc. indirect)	\$ N/A	
2.5	Equipment (inc. indirect)	\$ N/A	
2.6	Construction Management	\$ N/A	
2.7	Contingency	\$ N/A	
	TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0	Operation and Maintenance		
3.1	Annual Operating Labor	\$ N/A	
3.2	Annual Utilities	\$ N/A	
3.3	Annual Materials	\$ N/A	
3.4	Annual Maintenance	\$ N/A	
3.5	Annual Contingency	\$ N/A	
	TOTAL ANNUAL O & M	\$ N/A	
	X NUMBER OF YEARS OF OPERATION		
	TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0	Decontamination & Decommissioning		
4.1	Facility D&D	\$ N/A	
4.2	Closure, Post-Closure, Monitoring	\$ N/A	
	TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0	Contracted Services		
5.1	Commercial Treatment/Disposal	\$ N/A	
5.2	Mobile Treatment	\$ N/A	
	TOTAL CONTRACTED SERVICES		\$
6.0	Offsite Treatment (DOE)		\$ 876
7.0	Transportation		\$ 97
8.0	Disposal		\$ 3,000
	SUB COST FOR STABILIZATION MODULE		\$ 3,973
	ESCALATION		1.06
	TOTAL COST		\$ 4,211

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W018
Option Number: SR-W018-7
Facility: Vendor

Filter Paper Take Up Rolls

Treatment Technology Plasma Hearth

Option rejected during technical success factor evaluation. No further analysis performed.

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Summary Page

Waste Stream Number & Name: SR-W019 Receiving Basin for Off Site Fuel (RBOF)
High Level Liquid Waste

Background Information

Processes have been changed to remove the hazardous characteristic from this waste stream. The previously generated, existing waste in storage is indistinguishable from the 221-H Canyon waste stream as both have been combined and are stored in the H-Area HLW Tank Farm.

Changes have now been made in the processing of this waste stream prior to its discharge to the H-Area Tank Farm. It is no longer necessary to maintain such a high pH to prevent corrosion in the tanks during storage. This adjustment reduced the pH to below regulatory limits for alkaline characteristic so that it is no longer classified as a mixed waste because it no longer carries the corrosive characteristic. Former waste generated by the receiving basin for offsite fuels waste is indistinguishable from other wastes stored in the H-Area tank farm. As a result, this waste stream has been deleted from the Mixed Waste Inventory Report and the volume of waste previously generated is reported in the volume listed under 221-H Canyon High Level Liquid Waste (SR-W017).

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Summary Page

Waste Stream Number & Name: SR-W020 In-Tank Precipitation (ITP) Filters

Background Information

A future debris waste stream generated from the In-Tank Precipitation (ITP) process which treats and separates radioactive salt solution in preparation for processing in the Defense Waste Processing Facility (DWPF) and Saltstone Facility. The salt solution is treated with tetraphenyl borate and sodium titanate to precipitate radioactive cesium, strontium, and plutonium. This precipitate is filtered by the ITP Filters and is expected to eventually foul the filters, requiring their replacement, treatment, and disposal. The filter consists of 144 sintered metal tubes. Each tube is 10 feet long and sits in an assembly measuring 14 feet long by 1.5 feet in diameter.

Volume

- Expected 1993-1997 volume generation is 16.3 m³.

Waste Stream Composition

- Inorganic Debris

Waste Code

- D009A (TCLP Hg), D018 (benzene)

LDR Treatment Standard

- D009A = concentration based standard = 0.2 mg/l
- D018 = no treatment standard yet developed by EPA
- Alternate debris technology may be applied

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium since this waste stream has not yet been generated.
- Typical expected concentration is 286g Hg, 5000g benzene per filter. This is estimated by calculation.

Radiological Characterization

- Total activity is estimated to be 3400 Ci/filter.
- Beta/gamma emitters are Cs¹³⁷, Cs¹³⁴, Sr⁹⁰, Tc⁹⁹, Ru¹⁰⁶, Sb¹²⁵, and I¹²⁹.
- Waste is remote handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for In-Tank Precipitation Filters is in situ treatment using an Acid Wash technology followed by placement in an engineered stainless steel containment box in compliance with an approved treatability variance.

Treatment Justification

In-depth options analysis is not required for this waste stream since the waste stream meets the treatment standards without addition treatment.

Waste Stream treated by oxalic acid wash followed by placement into an engineered box under authority of a treatability variance approved by the Environmental Protection Agency, Region IV.

A determination has been made that in the process of filtering salt solution from the tank farm to remove highly radioactive cesium and other contaminants, the filters could become clogged to the point that they could not effectively operate, they could not be satisfactorily cleaned to allow operation. At that time, the filters would have to be declared a waste. The

material to be filtered is characteristically hazardous from mercury and benzene. Because of the nature of the precipitated material and its high level of radioactivity, it will not be possible to remove it from the filters sufficiently to reduce the potential concentration of mercury below the treatment standard. Also, benzene generation within the material will continue over time as a result of the radiological activity degrading the tetraphenyl borate. Therefore, the filters will be a mixed waste. Because of the make up of the filter and the high radioactivity level, it is not considered practical to treat the filters in a manner to satisfy the treatment standard for mercury or effectively treat the benzene. Therefore, the SRS proposed an alternative treatment of oxalic acid wash followed by placement in an engineered box and requested a treatability variance from the treatment standards for this waste stream. The variance was submitted to the U.S. Environmental Protection Agency in January 1992. Final approval for the variance was granted by the EPA in October 1, 1993.

Waste Stream Number & Name: SR-W020 In-Tank Precipitation (ITP) Filters
Facility: ITP In-Situ Treatment Technology Encapsulation
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☐ contact handled ☒ remote handled

Module Location: SRS

Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ 0
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$	
3.2 Annual Utilities	\$	
3.3 Annual Materials	\$ 600	
3.4 Annual Maintenance	\$	
3.5 Annual Contingency	\$ 40	
TOTAL ANNUAL O & M	\$ 640	
X NUMBER OF YEARS OF OPERATION	3.0	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 1920
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 0
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$ 0
6.0 Offsite Treatment (DOE)		\$ 0
7.0 Transportation		\$ 0
8.0 Disposal		\$ 600
SUB COST FOR MODULE		\$ 2520
ESCALATION		1.126
TOTAL COST		\$ 2838

If above numbers do not appear to add correctly, it is the result of computer rounding.

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Summary Page

Waste Stream Number & Name: SR-W021 Poisoned Catalyst Material

Background Information

A proposed future waste stream which was to have been generated by the treatment and destruction of benzene vapors generated in the In-Tank Precipitation process. The waste is no longer expected to be generated. This waste stream will be deleted from the Mixed Waste Inventory Report and the Site Treatment Plan.

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Summary Page

Waste Stream Number & Name: SR-W022 Defense Waste Processing Facility (DWPF)
Benzene

Background Information

A future waste stream generated from DWPF operations to vitrify high-level waste. Prior to introduction into the vitrification process, feed chemicals containing tetraphenyl borate react with the waste precipitate slurry to remove unwanted radiological constituents. The reaction between the precipitate slurry and the process feed chemicals within the precipitate reactor will liberate benzene from the slurry. The tetraphenyl borate compounds will decompose in the presence of formic acid and copper catalyst to form boric acid, formate salts, and organics (primarily benzene). This offgas will be condensed and transferred to the Organic Waste Storage Tank (OWST). The OWST is solely a storage and transfer facility; no treatment of the benzene occurs in the tank.

This waste stream is essentially 100% organic substances, with only incidental carry-over of aqueous material. The organic stream, which is primarily benzene (80%-95%), also is composed of biphenyl, diphenylamine, phenol, and diphenylmercury (~5%-20% combined total). The benzene is contaminated with radioactive cesium and mercury. The primary radiological contaminant is cesium since cesium is a fairly volatile metal.

Volume

- Expected 1993-1997 volume is 380 m³.

Waste Stream Composition

- Organic Liquid

Waste Code

- D001A (ignitable high TOC), D009A (TCLP Hg), D018 (benzene)

LDR Treatment Standard

- D001A = Specified Technology – Fuel Substitution, Recovery of Organics, or Incineration
- D009A = Concentration based standard – 0.2 mg/l
- D018 = no treatment standard yet developed by EPA

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based on the availability of analysis on pilot feed stream.
- Typical contaminant levels are 15-120 mg/l Hg, benzene = 80%-95% of organic waste stream

Radiological Characterization

- Presence of beta/gamma emitters.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for the Defense Waste Processing Facility Benzene waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Treatment Justification

In-depth options analysis was not performed for this waste stream.

During development of the Consolidated Incineration Facility (CIF) design basis, a determination was made of the types and volumes of hazardous, low level radioactive, and

mixed Savannah River Site (SRS) waste streams that would be generated in the future or were in storage for which treatment by incineration would be beneficial. The determination to initiate development of CIF was based on the facts that incineration was recommended or required by environmental regulations and a significant volume or toxicity reduction would be achieved. The waste amenable to incineration were grouped by physical state, solid or liquid, and type of contamination, hazardous and/or radioactive. Some wastes such as Defense Waste Processing Facility benzene and low level radioactive job control waste were individually designated a waste group. The waste groups and current/future volume data were adopted as a design basis for the CIF Functional Performance Requirements (FPR), OPS-WMP-90-4140. The FPR serves as the baseline design document for the initiation of project development at the SRS.

Based on physical and chemical characteristics, the SRS Mixed wastes already designated for treatment at the CIF fall into one of the CIF design basis waste groups listed as follows:

<u>FPR Waste Group</u>	<u>SRS Mixed Waste Streams</u>
Beta/Gamma Boxed (Solid)	Solvent Contaminated Debris (SR-W003)
	Toxic Clean Up Material (SR-W012)
High BTU (Liquid)	Scintillation Solution (SR-W010)
Chlorinated (Liquid)	Radioactive Contaminated Solvents (SR-W001)
	Radioactive Contaminated
	Chlorofluorocarbons (SR-W002)
	Freon 11/Oil (SR-W035)
DWPF Organic	DWPF Benzene (SR-W022)
Naval Fuel Organic	Spent Methanol (SR-W030)

Some of the CIF design basis waste groups listed in the table are designated in the FPR as nonradioactive hazardous waste. The radioactive nature of the waste does not impact its combustion characteristics. The operation and efficiency of the CIF combustion and air pollution control systems are not influenced by the presence of radioactivity. A mixed waste that meets the chemical and physical criteria of a design basis nonradioactive waste group can be treated in the CIF as effectively as the nonradioactive waste.

The CIF Mission Need and Design Capacity Review (07/07/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 07/29/93) reevaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to generally reexamine the appropriateness of each FPR design basis waste group and additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to an FPR nonradioactive waste group. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA Land Disposal Restriction requirements.

Alternative Technologies Investigated

Chemical Oxidation

Chemical oxidation involves the addition of a chemical oxidizing agent, such as ozone, to the waste stream. The organic material in the waste is oxidized to carbon dioxide and water vapor. The offgas would be passed through carbon filters to remove any volatile organic vapors generated. This process was developed for dilute organic streams, not for concentrated organic wastes. Formation of incomplete oxidation by-products would be difficult to prevent. The time required for complete oxidation of the waste could be unacceptably long. Also, this treatment has not been demonstrated or developed for this waste stream. Until such technology development work is completed, this technology is not considered a viable treatment alternative.

Steam Gasification

Steam gasification uses superheated steam to oxidize complex organic compounds to carbon monoxide, carbon dioxide, water, hydrogen, and methane. The destruction of organics is completed at high temperature using an electrically-heated reactor. Heavy metals and halogens are removed by adsorption beds. This technology was tested at SRS for treatment of this waste stream. Although destruction efficiencies of 99.99 were obtained, excessive carbon formation resulted in catastrophic failure of the reactor after a few days of operation. Thus, this technology was rejected as a possible treatment alternative.

The Government Accounting Office (GAO) estimates that steam gasification could reach "full-rate operations" around 2007 to 2011.

Selected Treatment Technology

The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration. Since no acceptable alternative treatment technology for this waste was identified, the selected technology is incineration followed by stabilization of the residuals. Incineration destroys organic constituents, generates a residual which is easily stabilized, and significantly reduces the waste volume requiring disposal. Incineration is the technology typically used for treatment of this waste type.

Nevertheless, should administrative or technical reasons prevent CIF's operation, other alternatives for benzene treatment must be considered. These alternatives are "options" only in the loosest sense. Many technologies have just begun to be developed, and hold but a remote possibility of maturing into viable methods. Others offer no technological advantage over CIF.

Consideration of the shortcomings of all available alternatives leads to the conclusion that incineration is the only currently acceptable treatment for DWPF benzene. If CIF cannot commence operations, the services of a vendor's incinerator would have to be obtained.

Onsite Incineration by Mobile Incinerator

A mobile incinerator offers no technological advantage over CIF. Many objections raised to CIF incineration also apply to a mobile unit. To prepare a vendor solicitation package, evaluate proposals, and select a vendor may take 12 to 18 months from authorization to proceed.

Offsite Incineration

Offsite incineration (or "thermal destruction," or "pyrolysis") offers no technological advantage over onsite incineration. Moreover, transportation of the benzene waste stream to the incinerator's location incurs additional safety and environmental risk. To prepare a vendor solidification package, evaluate proposals, and select a vendor may take 12 to 18 months from authorization to proceed.

Molten Metal

Molten metal processing is primarily a method for recovering metals from scrap. One vendor alleges that the process could be adapted to destruction of benzene. The benzene stream would be injected into a pool of molten metal in an anaerobic atmosphere. The "closed-loop, recycle" design is supposed to result in zero air emissions. From the literature available it is difficult to deduce the fate of the carbon and hydrogen liberated by the reduction of the benzene ring.

This technology is currently bench scale. One vendor estimates that the process is 3 to 5 years away from commercial application, with obtaining environmental permits as the critical path. The GAO estimates that molten metal technology could reach "full-rate operations" around 2007 to 2008.

Aerobic Digestion

Communities of microorganisms in the presence of oxygen can metabolize organic compounds into CO_2 and biomass. High rate aerobic processes ("activated sludge plants") require large volumes of air to be pumped through the bioreactors. For benzene to be accessible to the micro-organisms, it would have to be dissolved in water. As benzene is only "slightly soluble" in water, the amount needed to dissolve 150 gallons per day of benzene is significant. It is also to be expected that benzene would be released into the atmosphere from an activated sludge process. Large quantities of benzene in an aerobic environment could also pose a fire hazard.

Anaerobic Digestion

Communities of microorganisms in the absence of oxygen can metabolize organic compounds into CO_2 and CH_4 . High rate anaerobic digesters remain relatively small and inexpensive facilities. Nevertheless, they can prove difficult to startup. Destruction efficiency of anaerobic digesters usually does not exceed 90% of input biological oxygen demand (BOD). Trace amounts of certain chemicals can seriously reduce a digester's destruction efficiency and prolong startup. For benzene to be accessible to the microorganisms, it would have to be dissolved in water. As benzene is only "slightly soluble" in water, the amount needed to dissolve 150 gallons of benzene per day is significant.

Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE
STREAM SR-W001. SEE COST ESTIMATE SHEET FOR SR-W001.

Summary Page

Waste Stream Number & Name: SR-W023 **Safety/Control Rods**

Background Information

Cadmium rods encapsulated in stainless steel are used to control neutron flux in the reactors. Most rods are one inch in diameter and twenty-two feet long. There also are some smaller rods that were used in a test reactor. Cadmium is used as a neutron poison in the nuclear fission process.

Volume

- Current volume through 09/30/93 is 0.3 m³.
- Expected 1993-1997 volume will be 3.2 m³.

Waste Stream Composition

- Inorganic debris
- Cadmium containing metal debris

Waste Code

- D006A (TCLP Cd)

LDR Treatment Standard

- Concentration based standard = 1.0 mg/l
- Alternate debris technology may be applied

Waste Characterization

- Process knowledge and sampling and analysis used to characterize the waste.
- Contaminant level = 1473 mg/l Cd
- Confidence level high based on knowledge of materials of construction and TCLP analysis.
- TCLP analysis results on a non-radiated rod

Radiological Characterization

- Calculated radiation rates reported as 10-56 R/hr.
- Activation products and beta/gamma emitters Co⁶⁰, Ni⁵⁹ are present.
- Waste must be remotely handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for Cadmium Safety/Control Rods is Macroencapsulation in a cask as a 90 day generator.

Treatment Justification

In-depth options analysis is not required for this waste stream.

The final rule, Land Disposal Restrictions for Newly Identified Waste and Debris, 57 FR 37194, dated August 18, 1992, described the conditions for treatment of debris that would meet regulatory standards. Upon review of the regulation, it was determined that the Cadmium Safety/Control Rods met the requirements for macroencapsulation described in the new debris rule because the stainless steel sheathing represented a surface coating that consisted of an inert, inorganic material which substantially reduces surface exposure to potential leaching material and which is also resistant to degradation by the debris and contamination bring encapsulated.

Information describing the composition of the safety/control rods and the belief by SRS that this condition caused the safety/control rods to meet the debris treatment standard was transmitted to the U. S. Environmental Protection Agency via telephone on 8/24 and

9/29/92. Concurrence was received from Region IV on 9/29/94, substantiating the SRS opinion that no further treatment would be required on this waste stream to meet regulatory requirements.

To facilitate storage and disposal of the cadmium safety/control rods, it will be necessary to seal the rods in a cask. This action would also meet the definition of macroencapsulation. SRS had a cask already in existence which would serve this purpose; however, the cask was too short and necessitated that the rods be cut in order to fit the cask. Such cutting would affect the integrity of the encapsulation. Fabrication of another cask is prohibitively expensive. SCDHEC agreed that the cutting of the rods and placing them in the existing cask did not require a treatment permit. This decision is documented in correspondence between SRS and SCDHEC regarding the Cadmium Control and Safety Rod Management Plan (Roberts to Wilson, September 8, 1993 and Thompson to Roberts, November 9, 1993).

Waste Stream Number & Name: SR-W023 Safety/Control Rods
Facility: Waste stream is in a condition that already meets the Land Disposal
Restriction Treatment Standard.

Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☐ contact handled ☒ remote handled

Module Location: SRS

Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ 0
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor \$75,000/cask for placement	\$ 550	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ 200	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ 43	
TOTAL ANNUAL O & M	\$ 793	
X NUMBER OF YEARS OF OPERATION	1	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 793
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 0
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$ 0
6.0 Offsite Treatment (DOE)		\$ 0
7.0 Transportation		\$ 60
8.0 Disposal		\$ 120
SUB COST FOR MODULE		\$ 973
ESCALATION		1.029
TOTAL COST		\$ 1001

*Note: Cost of cask is a sunk cost.

If above numbers do not appear to add correctly, it is the result of computer rounding.

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Summary Page

Waste Stream Number & Name: SR-W024 Gold Traps

Background Information

This waste stream contains gold foil which traps elemental mercury entrained in process gases in the tritium facility. A typical trap consists of a stainless steel cylindrical housing that is 38 inches high and two inches in diameter that contains gold foil on 16 evenly spaced trays.

Volume

- Current volume through 09/30/93 is 2.3 m³.
- Expected 1993-1997 volume will be 0.2 m³.

Waste Stream Composition

- Elemental Mercury

Waste Code

- D009D (Elemental mercury contaminated with radioactive materials)

LDR Treatment Standard

- Specified technology = amalgamation

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based on knowledge of the process that generates the waste.
- No direct analysis made because of ALARA concerns for tritium.

Radiological Characterization

- Total activity estimated to be 1.6×10^9 nCi/g.
- Tritium present.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for Gold Traps is amalgamation. The waste stream already meets the treatment standard.

Treatment Justification

In-depth options analysis is not required for this waste stream since the waste stream meets the treatment standards without addition treatment.

Waste stream is in a condition that already meets the Land Disposal Restriction treatment standard.

The Land Disposal Restrictions require a specified technology for the treatment of elemental mercury contaminated with radioactive materials. The specified technology is amalgamation. Amalgamation is a process of utilizing inorganic reagents such as copper, zinc, nickel, gold, and sulfur to create a nonliquid, semi-solid amalgam which reduces the potential emissions of elemental mercury into the air.

The Savannah River Site submitted correspondence to the U. S. Environmental Protection Agency, Region IV, dated September 28, 1992, describing the amalgamation process for the liquid mercury released from the Tritium Facility and including a regulatory analysis demonstrating that the gold trap amalgam meets the elemental mercury contaminated with radioactive materials treatment standard. Concurrence was given by Region IV via telephone on October 2, 1992 that the gold traps did represent specified technology treatment for the

mercury waste stream emission from the Tritium Facility; that the Land Disposal Regulation was thus met; and no further treatment was necessary.

Waste Stream Number & Name: SR-W024 Gold Traps
Facility: Waste stream is in a condition that already meets the Land Disposal
Restriction Treatment Standard.

Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ 0
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor 1.0 casks/yr x 1500/2 casks	\$.750	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$.750	
X NUMBER OF YEARS OF OPERATION	5.0	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 3.75
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 0
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$ 0
6.0 Offsite Treatment (DOE)		\$ 0
7.0 Transportation		\$ 0
8.0 Disposal for 5 year window plus inventory (9 drums)		\$ 14.2
SUB COST FOR MODULE		\$ 18
ESCALATION		1.092
TOTAL COST		\$ 20

If above numbers do not appear to add correctly, it is the result of computer rounding.

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Summary Page

Waste Stream Number & Name: SR-W025 Solvent Waste <100 nCi/g TRU

Background Information

The waste stream is composed primarily of solids such as booties, lab coats, floor sweepings, rags, labware, and other job control waste generated primarily through separation activities for plutonium production. The waste stream includes small amounts of transuranic waste from onsite laboratories. Waste was declared mixed because of suspected solvent rags being in the waste. A conservative reading of the mixture rule causes all contents in a container to be characterized as listed waste due to the presence of solvent rags.

Volume

- Current volume through 09/30/93 is 2791.2 m³.
- No future waste generation expected because of a program implemented to segregate F-listed solvent rags from other job control waste. This waste stream ceased to be generated when the program began. (Thirds TRU <100 nCi/g is the current waste stream which evolved from SR-W025 under current F-listed solvent waste segregation.)

Waste Stream Composition

- Organic Debris

Waste Code

- D001C (Ignitable), D003D, D004A, D006A, D007A-9A, D011A (TCLP metals), D018-D019, D022-D026 (characteristic organics), F001-3, F005A, (halogenated and nonhalogenated spent solvents), P012, P015, P048, P113, P120 (acutely toxic commercial chemical wastes), U002, U032, U052, U080, U133, U134, U144, U151, U154, U161, U209, U211, U220, U226, U239 (commercial chemical wastes)

LDR Treatment Standard

- D001C, D003D specified technology – DEACT and meet F039 standards
- D004, D006-D009, D011; F001-F003, F005, P012, P048, U002, U032, U052, U080, U144, U151, U161, U209, U211, U220, U226, U239 concentration based standards = 0.025-170 mg/kg except 2-Ethoxyethanol, 2-Nitropropane-incineration
- D018-D019, D022-D026 no treatment standards yet developed by EPA
- P015 specified technology = RMETL or RTHRM
- P113 specified technology = RTHRM or STABL
- P120 specified technology = STABL
- U133 specified technology = FSUBS, CHOXD, CHRED or INCIN
- U134 specified technology = ADGAS fb NEUTR or NEUTR
- U154 specified technology = FSUBS or INCIN
- Alternate debris technology can be applied.

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is medium based on the varying composition of the job waste and the exact contents of specific waste containers.

Radiological Characterization

- Total activity is 10-100 nCi/g
- Contains Pu²³⁸, Pu²³⁹, Pu²⁴⁰, Pu²⁴¹, Pu²⁴², Am²⁴¹, U²³³, H³, Co⁶⁰, Cs¹³⁷, and other isotopes. Waste stream contains transuranics and alpha emitters.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred option for Solvent Waste with Less Than 100 nCi/g Transuranic Radionuclides (TRU) is to develop a plan to further characterize this waste stream to determine what components are suitable for shipment to the Waste Isolation Pilot Plant (WIPP) as TRU waste and what portion can undergo further option analysis for treatment as mixed low-level waste.

Treatment Justification

In-depth options analysis is not required for this waste stream. For further information on this waste stream, see the TRU Waste Management Section in Chapter 4 of Volume II.

This waste stream does not meet the DOE definition of Transuranic waste; however, the heterogeneous nature of the waste makes a high confidence level determination of transuranic contamination problematic. Because of the exposure concerns due to alpha contamination from these waste streams if treated with other forms of mixed waste, it has been determined the conservative approach would be to manage this waste in the same manner as true Transuranic waste.

For this waste matrix, incineration is an appropriate technology; however, the possibility of creating TRU waste when incinerating low-level waste with high levels of TRU radionuclides causes a dilemma. As a result, the conservative approach taken is to manage this waste in the same manner as a true transuranic waste.

Summary Page

Waste Stream Number & Name: SR-W026 Thirds TRU Waste

Background Information

This waste stream is a defense-related TRU waste and is composed primarily of solids such as booties, lab coats, floor sweepings, rags, labware, and other job control waste generated primarily through Separation activities for plutonium production.

Volume

- Current volume through 09/30/93 is 67 m³.
- Expected 1993-1997 volume will be 204 m³.

Waste Stream Composition

- Organic Debris

Waste Code

- D001C (Ignitable), D003D, D004A, D006A, D007A-D009A, D011A (TCLP metals), D018-19, D022-26 (characteristic organics), P012, P015, P048, P113, P120 (acutely toxic commercial chemical wastes), U002, U032, U052, U080, U133, U134, U144, U151, U154, U161, U209, U211, U220, U226, U239 (commercial chemical wastes)

LDR Treatment Standard

- Manage at the Waste Isolation Pilot Plant through a no migration demonstration.

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is medium based on the varying composition of the job waste as it is generated.

Radiological Characterization

- Total activity is >100 nCi/g
- Contains Pu²³⁸, Pu²³⁹, Pu²⁴⁰, Pu²⁴¹, Pu²⁴², Am²⁴¹, U²³³, H³, Co⁶⁰, Cs¹³⁷, and other isotopes (transuranics and alpha emitters).
- Waste is contact handled.
- Mixed transuranic waste (MTRU)

Preferred Option

The TRU National Program Plan is committed to placing all DOE defense related TRU type wastes (including TRU mixed wastes) into a National Repository currently identified as the Waste Isolation Pilot Plant (WIPP). Option analysis and selection of preferred option for TRU waste treatment are not addressed in this document. SRS has developed a strategy in regard to characterization, preparation to meet the WIPP-WAC, and interim storage of transuranic waste prior to shipment to the WIPP. This strategy is developed in the SRS Transuranic Waste Management Plan.

Treatment Justification

In-depth options analysis is not required for this waste stream. For further information on this waste stream, see the TRU Waste Management Section, Chapter 4 of Volume II.

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Summary Page

Waste Stream Number & Name: SR-W027 Solvent TRU Waste

Background Information

This waste stream is a defense-related TRU waste and is composed primarily of solids such as booties, lab coats, floor sweepings, rags, labware, and other job control waste generated primarily through separation activities for plutonium production. Waste was declared mixed because of suspected solvent rags being in the waste containers. A conservative reading of mixture rule causes the entire container contents to be treated as listed waste due to the presence of solvent rags.

Volume

- Current volume through 09/30/93 is 4955.6 m³.
- No future waste generation expected because of the program implemented to segregate F-listed solvent rags from other job control waste. This waste stream ceased to be generated when the program began. (Thirds TRU is the current waste stream which evolved from SR-W027 under current F-listed solvent waste segregation.)

Waste Stream Composition

- Organic Debris

Waste Code

- D001C (Ignitable), D003D, D004A, D006A, D007A-D009A, D011A (TCLP metals), D018-19, D022-26 (characteristic organics), F001-F003, F005A, (halogenated and nonhalogenated spent solvents), P012, P015, P048, P113, P120 (acutely toxic commercial chemical wastes), U002, U032, U052, U080, U133, U134, U144, U151, U154, U161, U209, U211, U220, U226, U239 (commercial chemical wastes)

LDR Treatment Standard

- Manage at the WIPP through a no migration determination.

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is medium based on the varying composition of the job waste and the exact contents of specific waste containers.

Radiological Characterization

- Total activity is >100 nCi/g
- Contains Pu²³⁸, Pu²³⁹, Pu²⁴⁰, Pu²⁴¹, Pu²⁴², Am²⁴¹, U²³³, H³, Co⁶⁰, Cs¹³⁷, and other isotopes. Waste stream contains transuranics and alpha emitters.
- Waste is contact handled.
- Mixed transuranic waste (MTRU)

Preferred Option

The TRU National Program Plan is committed to placing all DOE defense related TRU type wastes (including TRU mixed wastes) into a National Repository currently identified as the Waste Isolation Pilot Plant (WIPP). Option analysis and selection of preferred option for TRU waste treatment are not addressed in this document. SRS has developed a strategy in regard to characterization, preparation to meet the WIPP-WAC, and interim storage of transuranic waste prior to shipment to the WIPP. This strategy is developed in the SRS Transuranic Waste Management Plan.

Treatment Justification

In-depth options analysis is not required for this waste stream. For further information on this waste stream, see the TRU Waste Management Section, Chapter 4 of Volume II.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper – F006

Background Information

The filter paper is from a plate and frame filter press used in M-Area to filter etching solution from nickel plating solutions. No cyanide, silver, cadmium, chromium, or lead were used in plating operations. The filter paper is contaminated with residual filter cake.

Volume

- Current volume through 09/30/93 is 1.0 m³.
- No future waste generation expected because the manufacturing process which generated this waste is no longer operational.

Waste Stream Composition

- Organic Debris

Waste Code

- F006 (metal plating line waste, without cyanide)

LDR Treatment Standard

- Concentration based standard = 0.066-5.2 mg/l

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based upon analysis on a similar material and knowledge that the process generates a listed hazardous waste.
- Metals present are primarily Ni with Pb, Ag, Cd and Cr.

Radiological Characterization

- Total activity is 10-100 nCi/g.
- Alpha emitters are U²³⁴, U²³⁵, U²³⁶, and U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
ETF	Wastewater	ETF has no process to treat this waste.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
LETF	Wastewater	Wastewater treatment is not designed to treat this stream.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper – F006

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W028-1	CIF	Incineration	94	60	74	SR-W018-01	√
SR-W028-2	M-Area	Vitrification	75	60	74	SR-W018-02	
SR-W028-3	CIF	Ashcrete	88	57	71	SR-W018-05	
SR-W028-4	Cont. Bldg.	S. S. Box	100	58	72	SR-W018-03	
SR-W028-5	HW/MW-TB	S. S. Box	100	58	72	SR-W018-04	
SR-W028-6	INEL/WEDF	Stabilization	*	51	65	SR-W018-06	
SR-W028-7	Vendor	Plasma Hearth	1				
SR-W028-8	Vendor	Plasma Arc	1				

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

Plasma Arc Centrifugal Treatment by Vendor

Plasma arc centrifugal treatment by vendor was rejected because:

- Plasma arc centrifugal incineration is currently still in the laboratory with no units in the field. Hence, $P_m=0.9$.
- Control of the process requires sophisticated computerized instrumentation. Hence, $P_c=0.9$.
- It is not expected for this technology to reach a level of reliability suitable for industrial application for 5-10 years.

Plasma Hearth Process by Vendor

Plasma hearth process by vendor was rejected because:

- Plasma hearth incineration is currently still in the laboratory. While prototypes may exist, they have no record of continuous reliable operation in industrial settings. Hence, $P_m=0.9$.
- Control of the process requires sophisticated computerized instrumentation. Hence, $P_c=0.9$.
- It is not expected for this technology to reach a level of reliability suitable for industrial application for 5-10 years.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Mark 15 Filter Paper waste stream is pretreatment by cutting or shredding, Incineration followed by stabilization in the Consolidated Incineration Facility (CIF).

This option treats the constituent of concern, plating line waste, by incinerating the combustible fraction of the filter paper by conversion to carbon dioxide and water, and stabilizing the metal-containing ash.

This option is preferred because:

- Waste volume will be reduced by a factor of at least 2.
- Final waste form will meet LDR standards.
- Incineration and ash stabilization are demonstrated technologies.

- CIF is currently under construction.
- Residual solids are stabilized with cement.
- It is a cost-effective option.

Options Rejected During IDOA

Ashcrete Stabilization at CIF

Ashcrete Stabilization at CIF was rejected because:

- Waste volume more than doubles.
- Final waste form requires disposal in HW/MW facility.

Vitrification by M-Area Vendor Treatment Process

Vitrification by M-Area Vendor Treatment Process was rejected because:

- Extensive treatability studies will be required to confirm viability of treatment method.
- Uncertainties exist about vitrifier's capability of handling waste material added directly to the melt pool.
- Without treatment of waste stream SR-W018 also, to help bear the burden of overhead costs, this option is not cost effective.

Macroencapsulation in Stainless Steel Boxes (either in a Containment Building or in HW/MW-TB)

Macroencapsulation in stainless steel boxes (either in a containment building or in HW/MW-TB) was rejected because:

- Waste volume more than doubles.
- Final waste form requires disposal in HW/MW facility.

Stabilization at INEL/WEDF

Stabilization at INEL/WEDF (encapsulating the waste with a grout matrix) was rejected because:

- Waste volume more than doubles.
- Final waste form requires disposal in HW/MW facility.

Waste Stream Number & Name: SR-W028
Option Number: SR-W028-1
Facility: CIF

Mark 15 Filter Paper – F006

Treatment Technology Incineration

Treatment Cycle Flow Diagram:

Pros

- Expect at least 2:1 volume reduction.
- The waste stream is expected to meet all applicable LDR standards after treatment by this facility.
- Incinerator designed for a wide range of wastes with some operational limitations.
- Waste required no additional treatment to meet shipping requirements.
- Final waste form meets the expected WAC upon exit from the process.
- Incineration is a current demonstrated technology, and all elements and processes have been previously demonstrated.
- Process failure should not create a waste that cannot be treated by existing technologies.
- Reasonably easy to schedule this waste stream assuming current startup schedule.
- Most of the additional metals in this waste stream will be captured in the ashcrete. Resulting in little or no emission even in most accidents.
- No increase in non operational workers is required to treat this waste, but increase in non-routine maintenance will be required.
- No impact due to this waste stream. No impact because there is no increase in exposure potential and no additional workers are required.
- Processes are in full compliance with all applicable regulations and no process modifications are needed.
- This waste is part of the basis for permitting. Final waste form must meet the LDR treatment standards.
- Line item is funded.

Cons

- 100% of the final waste form will go to the HW/MW Vaults.
- The public has limited acceptance of treatment involving incineration.

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper – F006
Option Number: SR-W028-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	70	Subtract 10 points from the median score of 80 because expect at least 2:1 volume reduction.
• secondary waste generation	50	Significant volume of secondary waste due to non-combustible sludge and it can be handled by an existing technology.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because the waste stream is expected to meet all applicable LDR standards after treatment by this facility.
• flexibility	80	Incinerator designed for a wide range of wastes with some operational limitations.
• ability to be shipped	80	Waste required no additional treatment to meet shipping requirements.
• final waste form	80	Final waste form meets the expected WAC upon exit from the process.
<i>Engineering Parameters</i>		
• system implementability	100	Incineration is a current demonstrated technology. Add 20 points to the median score of 80 because all elements and processes have been previously demonstrated.
• availability	50	Incinerator availability for solids is 50. Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load.
• scalability	50	Process can accept a range of input but capacity is set by design. Excess capacity does exist at this point.
• remedial measures	70	The presence of metals in the secondary wastes might require rework. Subtract 10 points from the median score of 80 because process failure should not create a waste that cannot be treated by existing technologies.
• schedule for treatment of waste	80	Reasonably easy to schedule this waste steam assuming current startup schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Most of the additional metals in this waste stream will be captured in the ashcrete. Resulting in little or no emissions even in most accidents.
• non-operational worker potential exposure	70	No increase in non operational workers is required to treat this waste. Subtract 10 points from the median score of 80 because increase in non-routine maintenance will be required.
• operational worker potential exposure	80	No impact due to this waste stream. No impact because there is no increase in exposure potential and no additional workers are required.
• transportation potential exposure	50	Requires transportation, but limited additional characterization required to support transportation.
<i>Regulatory Parameters</i>		
• need for variance	80	Processes are in full compliance with all applicable regulations and no process modifications are needed.
• ability to obtain a permit	80	This waste is part of the basis for permitting. Final waste form must meet the LDR treatment standards.

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper – F006
Option Number: SR-W028-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• waste disposal	20	100% of the final waste form will go to the HW/MW Vaults.
<i>Public Acceptance</i>		
• public acceptance	20	The public has limited acceptance of treatment involving incineration.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	80	Line item is funded.
<i>Industry Involvement</i>		
• market for technology	0	Technology has applicability at all DOE complex sites. Subtract 20 points from the median score of 20 because technology is being purchased.
• private sector involvement	100	Add 20 points to the median score of 80 because it is an existing technology.

IDOA Score: Technical 60 Total 74

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W018-1

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper – F006
Option Number: SR-W028-2
Facility: M-Area

Treatment Technology Vitrification

Treatment Cycle Flow Diagram:

Pros

- Volume reduction >5:1.
- All applicable LDR treatment standards are met.
- Fixed quantity of known waste.
- Will meet all shipping requirements.
- Final vitrified waste form will meet disposal WAC. No additional treatment required.
- An alternative study shows equipment is available for cutting rolls. A pilot scale demonstration has been successful.
- Recoverable. Recycle through melter.
- Schedule easily developed.
- It is not different from waste currently scheduled for treatment here.
- Additional non-routine maintenance required.
- Treatment will render waste form to compliance with LDR. No variance required.
- Treated waste disposable as LLW.

Cons

- Not budgeted. Will require increase in operating budget.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	90	Add 10 points to the median score of 80 because volume reduction >5:1.
• secondary waste generation	50	Some secondary waste in the form of a sludge will require further treatment by existing technology.
• destruction removal and demobilization efficiency	80	All applicable LDR treatment standards are met.
• flexibility	80	Vitrification technology can handle a wide variety of wastes without extensive adjustments in operating parameters.
• ability to be shipped	80	Will meet all shipping requirements.
• final waste form	100	Final vitrified waste form will meet disposal WAC. Add 20 points to the median score of 80 because no additional treatment required.

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper -- F006
Option Number: SR-W028-2
Facility: M-Area Treatment Technology Vitrification
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	80	An alternative study shows equipment is available for cutting rolls. A pilot scale demonstration has been successful.
• availability	50	Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curle load.
• scalability	20	Throughput fixed by design.
• remedial measures	80	Recoverable. Recycle through melter.
• schedule for treatment of waste	80	Schedule easily developed.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	90	Add 10 points to the median score of 80 because it is not different from waste currently scheduled for treatment here.
• non-operational worker potential exposure	80	Additional non-routine maintenance required.
• operational worker potential exposure	40	Size reduction and repackaging of waste will require extensive handling. Subtract 10 points from median score of 50 because of concerns about manual size reduction.
• transportation potential exposure	50	Nothing unusual about waste form. Expect low alpha and no liquids.
<i>Regulatory Parameters</i>		
• need for variance	80	Expect treatment to render waste form to compliance with LDR. No variance required.
• ability to obtain a permit	50	W. W. permit would exist though it may require some modification. DHEC could require a RCRA Part B Permit Application for M-Area with a change in waste stream.
• waste disposal	80	Treated waste disposable as LLW.
<i>Public Acceptance</i>		
• public acceptance	50	Stakeholder acceptance of a glass waste form is high, but lack of understanding technology and permitting may engender concerns.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	20	Not budgeted. Will require increase in operating budget.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 60 Total 74

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W018-2

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper -- F006
Option Number: SR-W028-3
Facility: CIF

Treatment Technology Ashcrete

Treatment Cycle Flow Diagram:

Pros

- No secondary waste produced by Ashcrete.
- The waste stream is expected to meet all applicable LDR standards after this treatment.
- The waste form meets the expected WAC. Waste form suitable for disposal in the form it exits the process.
- Ashcrete is a current demonstrated technology and a proven technology.
- Process failure should not create a waste form that can not be treated by existing technologies.
- Reasonably easy to schedule this waste stream assuming current startup schedule.
- The metals in this waste stream will be captured in the ashcrete. Very little emissions resulting in little or no emissions even during accidents.
- Additional non-routine maintenance required.
- Well accepted waste form. No variance required.
- Modification required to facilities existing permit, but final waste must meet LDR treatment standards.
- Line item is funded.

Cons

- It is expected to increase volume by factor of 3.
- 100% of the final waste form will go to the HW/MW Vaults.
- Waste form is not as permanent as other forms of stabilization.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because it is expected to increase volume by factor of 3.
• secondary waste generation	100	Add 20 points to the median score of 80 because no secondary waste produced by Ashcrete.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because the waste stream is expected to meet all applicable LDR standards after this treatment.
• flexibility	50	Waste handling of waste streams directly in ashcrete is an off-normal process, which lowers efficiency.
• ability to be shipped	50	Waste form may require additional characterization to determine that it satisfies shipping requirements.

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper – F006
Option Number: SR-W028-3
Facility: CIF Treatment Technology Ashcrete
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• final waste form	100	The waste form meets the expected WAC. Add 20 points to the median score of 80 because waste form suitable for disposal in the form it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to this median score of 80 because ashcrete is a current demonstrated technology and a proven technology.
• availability	50	Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load.
• scalability	50	Limited excess capacity exists because it is set by design.
• remedial measures	70	The presence of metals in the final waste form might require rework. Subtract 10 points from the median score of 80 because a process failure should not create a waste form that can not be treated by existing technologies.
• schedule for treatment of waste	80	Reasonably easy to schedule this waste stream assuming current startup schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	The metals in this waste stream will be captured in the ashcrete. Very little emissions resulting in little or no emissions even during accidents.
• non-operational worker potential exposure	70	Subtract 10 points from the median score of 80 because additional non-routine maintenance required.
• operational worker potential exposure	50	Increased operator handling due to this waste stream so the potential for exposure is increased.
• transportation potential exposure	50	Does not require additional characterization to support transportation and limited number of waste transports required.
<i>Regulatory Parameters</i>		
• need for variance	80	Well accepted waste form. No variance required.
• ability to obtain a permit	80	Modification required to facilities existing permit, but final waste must meet LDR treatment standards.
• waste disposal	20	100% of the final waste form will go to the HW/MW Vaults.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	80	Line item is funded.

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper - F006
Option Number: SR-W028-3
Facility: CIF Treatment Technology Ashcrete
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Incinerator purchased from a vendor. Incineration is common technology. Subtract 20 points from median score of 20 because DOE has nothing new to market.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing technology.

IDOA Score: Technical 57 Total 71

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W018-5

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Association for Information and Image Management

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301/587-8202

Centimeter

Inches

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7 of 10

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper – F006
Option Number: SR-W028-4
Facility: Containment Building Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- Process satisfies requirements of the "debris rule" and all applicable LDR standards are met.
- Can process a wide range of materials.
- S. S. containers will meet current DOT shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- All processes involved are existing technology.
- Similar systems have demonstrated availability of >80.
- Process failure does not produce altered waste form. A failed container is easily fixed.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.
- Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
- Exposure controlled by design and < average number of workers. Low potential for exposure.
- Little secondary waste.

Cons

- All waste will require disposal in HW/MW facilities.
- Not a budget item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met.
• flexibility	80	Can process a wide range of materials.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper – F006
Option Number: SR-W028-4
Facility: Containment Building Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved are existing technology.
• availability	80	Similar systems have demonstrated availability of >80%.
• scalability	50	Throughput is set by design and not easily expanded except by adding additional shifts of operation.
• remedial measures	90	Process failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container is easily fixed.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	80	Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
• operational worker potential exposure	80	Add 10 points to the median score because exposure controlled by design and < average number of workers. Low potential for exposure.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process satisfies requirements of the "debris rule."
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	20	All waste will require disposal in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the wasteform is not as permanent as vitrification.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	20	Not a budget item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because this is an existing technology.

IDOA Score: Technical 58 Total 72

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W018-3

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper - F006

Operation Number: SR-W028-5

Facility: HW/MW-TB

Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- Process satisfies requirements of the "debris rule" and all applicable LDR standards are met.
- Can process a wide range of materials.
- S. S. containers will meet current DOT shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- All processes involved are existing technology.
- Similar systems have demonstrated availability of >80.
- The process failure does not produce altered waste form. A failed container is easily fixed.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.
- Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
- Exposure controlled by design. Number of workers is dependent upon throughput.
- Little secondary waste.

Cons

- All waste will require disposal in HW/MW facilities.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
Process Parameters		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met.
• flexibility	80	Can process a wide range of materials.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.
Engineering Parameters		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved are existing technology.
• availability	80	Similar systems have demonstrated availability of >80%.
• scalability	50	Throughput is set by design and not easily expanded except by adding additional shifts of operation.

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper -- F006
Option Number: SR-W028-5
Facility: HW/MW-TB Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• remedial measures	90	The process failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container is easily fixed.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	80	Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
• operational worker potential exposure	80	Exposure controlled by design. Number of workers is dependent upon throughput.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process satisfies requirements of the "debris rule."
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	20	All waste will require disposal in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the wasteform is not as permanent as vitrification.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because this is an existing technology.

IDOA Score: Technical 58 Total 72

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W018-4

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper – F006

Option Number: SR-W028-6

Facility: INEL/WEDF

Treatment Technology Stabilization

Treatment Technology

The INEL WEDF Stabilization process provides treatments for aqueous and organic liquids and debris. The process stabilizes waste in a grout matrix to reduce leachability.

Pros

- Little secondary waste.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a RCRA facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.

Waste Stream Number & Name: SR-W028 Mark 15 Filter Paper - F006
Option Number: SR-W028-6
Facility: INEL/WEDF Treatment Technology Stabilization
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the state's acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	50	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 65

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W018-6

Waste Stream Number & Name: SR-W028
Option Number: SR-W028-7
Facility: Vendor

Mark 15 Filter Paper – F006

Treatment Technology Plasma Hearth

Treatment Cycle Flow Diagram:

Option rejected during technical success factor evaluation. No further analysis performed.

Waste Stream Number & Name: SR-W028
Option Number: SR-W028-8
Facility: Vendor

Mark 15 Filter Paper – F006

Treatment Technology Plasma Arc

Treatment Cycle Flow Diagram:

Option rejected during technical success factor evaluation. No further analysis performed.

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Summary Page

Waste Stream Number & Name: SR-W029 M-Area Sludge Treatability Samples

Background Information

This waste stream consists of stabilized sludge samples from the Process Waste Interim Treatment/Storage Facility of M-Area that has been stabilized with cement, cement/fly ash/blast furnace slag, or by vitrification. Samples are generated during waste treatability studies to determine the formulation of the stabilized waste form.

Volume

- Current volume through 09/30/93 is 1.0 m³.
- No future waste generation expected because M-Area Vendor Treatment Process treatability studies are completed; additional test samples may be generated.

Waste Stream Composition

- Cemented Solids/Vitrified Solids

Waste Code

- F006 (metal plating waste, without cyanide)
- Metal contaminants = Pb, Cr, Ni

LDR Treatment Standard

- Concentration based standards – 0.066-5.2 mg/l

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based on total constituent analysis performed on the sludge and knowledge that the process generates a listed waste.
- The primary contaminant is Ni with other metals present being Pb and Cr.

Radiological Characterization

- Total activity is 0.0176 Ci.
- Alpha emitters are U²³⁴, U²³⁵, and U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for M-Area Sludge Treatability Samples is stabilization by Vitrification in the M-Area Vendor Treatment Process.

Treatment Justification

In-depth options analysis is not required for this waste stream since a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

The proposed action is to stabilize the M-Area mixed wastes utilizing a thermal vitrification process. The process facility would be constructed and operated by a subcontractor to the Westinghouse Savannah River Company. The vitrification process would result in the lowest volume of stabilized waste for final disposal, provide the most durable final waste form, and could be completed for the lowest cost (including final disposal costs) of all treatment alternatives for wastes needing to be treated in M-Area.

The proposed action was evaluated with respect to the technical ability to meet the Land Disposal Restriction criteria for the final stabilized waste form, and for the overall cost of the treatment activities. The ability to meet the durability requirements, that is, Toxicity Characteristic Leaching Procedure (TCLP) testing requirements, for constituents of concern in the final waste form was a critical consideration. The total life cycle cost, including the

cost of treating the waste itself, the cost to treat any effluents generated by the vendor, and the cost to dispose of the final waste form were also considered. In addition, the environmental impacts, onsite and offsite health effects, and occupational health and safety concerns for this treatment method were evaluated.

When blending and treatment of the Intermediate Treatment/Storage Facility sludge is begun, it is projected that approximately 700,000 gallons of F006 listed mixed waste will be in storage in the tanks. This includes an estimated 50,000 gallons of supernate which cannot be separated from the sludge. Waste streams stored in the tanks include M-Area Plating Line Sludges from Supernate Treatment, SR-W004; M-Area High Nickel Plating Line Sludge, SR-W037. One waste stream (SR-W054 -- analytical laboratory residue, total volume 35 gallons) has been combined with waste stream SR-W037. SR-W054 is now indistinguishable from form SR-W037 and will be treated identically.

Other M-Area mixed wastes to be treated are stored in 55 gallon drums in the Mixed Waste Storage Shed in M-Area. These wastes include:

- A Watts Plating bath, California list waste solution, SR-W039, Nickel Plating Line Solution
- Mark 15 sludge filter cake, waste stream SR-W005, Mark 15 Filter Cake
- Solid treatability sample residues, waste stream SR-W029, M-Area Sludge Treatability Samples

Two drums of Plating Line Sump Material (SR-W038) are stored in the 645-2N storage facility.

Equipment required for treatment of the M-Area waste would continue to belong to the vendor and, if the equipment could meet Department of Transportation shipping criteria for radioactivity, would be removed from SRS. If equipment could not be successfully decontaminated, it would be disposed onsite. The cost of disposal was a part of the total contract cost.

The M-Area Vendor Treatment Process is capable of effectively treating all of these waste streams to meet regulatory requirement. As a result, upon completion of treatment, all listed and characteristically hazardous waste sludges and liquids from M-Area operations will be eliminated.

Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE STREAM SR-W004. SEE COST ESTIMATE SHEET FOR SR-W004.

Summary Page

Waste Stream Number & Name: SR-W030 Spent Methanol Solution

Background Information

This waste stream was generated in a classified operation at the now closed Naval Fuels (NF) Facility.

Volume

- Current volume through 09/30/93 is 0.2 m³.
- No future waste generation expected because manufacturing process (NF) which generated this waste is no longer operational.

Waste Stream Composition

- Organic Liquid

Waste Code

- D001A (ignitable high TOC), D006A (TCLP Cd), D010A (TCLP Se) nonwastewater

LDR Treatment Standard

- D001A = Specified Technology – Fuel Substitution, Recovery of Organics, or Incineration
- D006A, D010A – concentration based standard – 1.0 - 5.7 mg/l

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high because of analysis availability.

Radiological Characterization

- Typical activity is 16.4 nCi/g
- Alpha emitter is U²³⁵.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for the Spent Methanol waste stream is Incineration in the Consolidated Incineration Facility.

Treatment Justification

In-depth options analysis was not performed for this waste stream.

During development of the Consolidated Incineration Facility (CIF) design basis, a determination was made of the types and volumes of hazardous, low level radioactive, and mixed Savannah River Site (SRS) waste streams that would be generated in the future or were in storage for which treatment by incineration would be beneficial. The determination to initiate development of CIF was based on the facts that incineration was recommended or required by environmental regulations and a significant volume or toxicity reduction would be achieved. The waste amenable to incineration were grouped by physical state, solid or liquid, and type of contamination, hazardous and/or radioactive. Some wastes such as Defense Waste Processing Facility benzene and low level radioactive job control waste were individually designated a waste group. The waste groups and current/future volume data were adopted as a design basis for the CIF Functional Performance Requirements (FPR), OPS-WMP-90-4140. The FPR serves as the baseline design document for the initiation of project development at the SRS.

Based on physical and chemical characteristics, the SRS Mixed wastes already designated for treatment at the CIF fall into one of the CIF design basis waste groups listed as follows:

FPR Waste Group

Beta/Gamma Boxed (Solid)

High BTU (Liquid)

Chlorinated (Liquid)

DWPF Organic

Naval Fuel Organic

SRS Mixed Waste Streams

Solvent Contaminated Debris (SR-W003)

Toxic Clean Up Material (SR-W012)

Scintillation Solution (SR-W010)

Radioactive Contaminated Solvents (SR-W001)

Radioactive Contaminated

Chlorofluorocarbons (SR-W002)

Freon 11/Oil (SR-W035)

DWPF Benzene (SR-W022)

Spent Methanol (SR-W030)

Some of the CIF design basis waste groups listed in the table are designated in the FPR as nonradioactive hazardous waste. The radioactive nature of the waste does not impact its combustion characteristics. The operation and efficiency of the CIF combustion and air pollution control systems are not influenced by the presence of radioactivity. A mixed waste that meets the chemical and physical criteria of a design basis nonradioactive waste group can be treated in the CIF as effectively as the nonradioactive waste.

The CIF Mission Need and Design Capacity Review (07/07/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 07/29/93) reevaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to generally reexamine the appropriateness of each FPR design basis waste group and additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to an FPR nonradioactive waste group. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA Land Disposal Restriction requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Alternative Technologies Investigated

Biological Treatment

Biological treatment involves developing specific bacteria that destroys particular hazardous chemicals contained in the waste. Biological treatment is not effective for concentrated organic liquid wastes because this technology has not been demonstrated on concentrated organic liquid wastes, it is not considered a viable treatment alternative. Since these wastes contain a large variety of organic species, development of bacteria to handle all the compounds would be very difficult. Biological treatment is most often used in cases where concentrations of the hazardous organics are low (ppm).

Chemical Oxidation

Chemical oxidation involves the addition of a chemical oxidizing agent, such as ozone, to the waste stream. The organic material in the waste is oxidized to carbon filters to remove volatile organic vapors generated. This process has not been used for concentrated organic waste streams. Formation of incomplete oxidation by-products would be difficult to prevent. The time required for complete oxidation of the waste could be unacceptably long. The inclusion of a wider variety of organic compounds in the waste only makes chemical oxidation treatment more difficult. Until this technology is developed and demonstrated for concentrated organic liquids, it is not considered a viable treatment alternative.

Stabilization

There are a variety of stabilization technologies capable of solidifying this waste stream.

The inclusion of a wider variety of organic compounds in the waste only makes stabilization more difficult. Again, land disposal of large quantities of hazardous organic compounds, even

if they can be made to pass treatment standards, is considered an undesirable waste disposal practice.

Selected Treatment Technology

Since no acceptable alternative treatment technology for this waste was identified, the selected technology is incineration followed by stabilization of the residuals. Incineration destroys organic constituents, generates a residual which is easily stabilized, and significantly reduces the volume of waste placed in permanent disposal facilities. Incineration is the technology typically used by industry for treatment of this waste type.

Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE STREAM SR-W001. SEE COST ESTIMATE SHEET FOR SR-W001.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution

Background Information

This waste stream is a one-time waste generation. A portion of the waste stream was generated by the Naval Fuels laboratory to assay uranium content by scintillation/Davis Gray procedure. It is a 2% solids solution in a glass container overpacked in a 55 gallon drum. Another portion of the waste stream came from removing sludge accumulated in stainless steel air ducts in the Naval Fuels Facility from which uranium caused a reaction with the stainless steel, liberating leachable chromium. This waste is a sludge form in two lined 55 gallon drums.

Volume

- Current volume through 09/30/93 is 0.6 m³.
- No future waste generation expected because the manufacturing process (Naval Fuels) which generated this waste, is no longer operational.

Waste Stream Composition

- Aqueous Liquid
- Inorganic Sludge/Particulate

Waste Code

- D007A – (TCLP Cr)

LDR Treatment Standard

- Concentration based standard = 5.0 mg/l

Waste Characterization

- Process knowledge and sampling and analysis used to characterize the waste.
- Process knowledge was used to characterize laboratory waste stream via mass balance calculation.
- Confidence level is high because analysis was performed on the duct cleaning waste from Naval Fuels.

Radiological Characterization

- Total activity is 0.4 nCi/g.
- Alpha emitter is U²³⁵.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Incineration	The constituents of concern would end up in the ash. Ashcrete will not immobilize them to pass TCLP.
ETF	Wastewater	ETF cannot accept this level of uranium in the facility.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
LETF	Wastewater	LETF cannot handle this quantity of uranium.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W031-1	M-Area	Vitrification	100	61	75	673	√
SR-W031-2	Vendor/Onsite	Polymer Encapsulation	88	59	73	563	
SR-W031-3	CIF	Ashcrete	88	58	71	2048	
SR-W031-4	Vendor/Onsite	Stabilization	75	58	72	563	
SR-W031-5	Cont. Bldg.	Ir-Drum Stab.	51	51	65	1249	
SR-W031-6	INEL/WEDF	Stabilization	*	51	65	586	

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

- No options were rejected.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Uranium/Chromium Solution waste stream is Vitrification in the M-Area Vendor Treatment Process.

This option treats the constituent of concern, chromium, by stabilizing it in non-leaching glass matrix.

This option is preferred because:

- Volume reduction will be greater than a factor of 5.
- Treatment meets LDR.
- This small volume waste stream can be easily processed along with the wastes for which the vendor vitrification unit was originally contracted.
- The final waste form is very stable and long-lived.
- This option is cost effective.

Options Rejected During IDOA

Encapsulation (at CIF in ashcrete, in a Containment Building, by a Vendor)

Encapsulation (at CIF in ashcrete, in a containment building, by a vendor) was rejected because:

- Final waste form not as long-lived as the preferred option.
- Waste volume will more than double.
- Majority of the final waste will require disposal in HW/MW facility.

Stabilization at INEL/WEDF

Stabilization at INEL/WEDF (encapsulating the waste with a grout matrix) was rejected because:

- Large volume waste streams are designated to be treated onsite.
- It is less cost effective than the preferred option.
- Waste volume will more than double.
- Existing process will have to be expanded to handle this waste.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-1
Facility: M-Area Treatment Technology Vitrification

Treatment Cycle Flow Diagram:

Pros

- Volume reduction >5:1.
- Rinse water can be treated in DETF and released to outfall.
- All applicable LDR treatment standards are met and if waste is delisted (F006), final waste will be non-hazardous.
- Fixed quantity of waste, expect system to easily handle.
- Containerization required. Will meet all shipping requirements.
- Final vitrified waste form will meet disposal WAC. No additional treatment required.
- Small amount of waste which can be processed easily with other vitrifier feeds.
- Failed waste form can be recycled through the melter.
- Scheduled with other wastes for vitrification.
- Not different from waste currently scoped for treatment. Emissions are few and controlled even in accident scenarios.
- Expect treatment to render a waste form to compliance with LDR. No variance required.
- Treated waste form disposable as LLW.

Cons

- Unbudgeted.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	90	Add 10 points to the median score of 80 because volume reduction >5:1.
• secondary waste generation	80	Rinse water can be treated in DETF and released to outfall.
• destruction removal and demobilization efficiency	100	All applicable LDR treatment standards are met. Add 20 points to the median score of 80 because if waste is delisted (F006), final waste will be non-hazardous.
• flexibility	80	Fixed quantity of waste, expect system to easily handle.
• ability to be shipped	80	Containerization required. Will meet all shipping requirements.
• final waste form	100	Final vitrified waste form will meet disposal WAC. Add 20 points to the median score of 80 because no additional treatment required.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-1
Facility: M-Area Treatment Technology Vitrification
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	80	Demonstrated for high level vitrification.
• availability	80	Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load. 80% availability expected.
• scalability	80	Small amount of waste which can be processed easily with other vitrifier feeds.
• remedial measures	80	Failed waste form can be recycled through the melter.
• schedule for treatment of waste	80	Scheduled with other wastes for vitrification.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	90	Not different from waste currently scoped for treatment. Add 10 points because emissions are few and controlled even in accident scenarios.
• non-operational worker potential exposure	50	Some additional maintenance required.
• operational worker potential exposure	40	Subtract 10 points from the median score of 50 because waste contains enriched uranium, potential criticality issues.
• transportation potential exposure	50	Additional characterization may be required.
<i>Regulatory Parameters</i>		
• need for variance	80	Expect treatment to render a waste form in compliance with LDR. No variance required.
• ability to obtain a permit	50	Wastewater permit would exist though it may require some modification. SCDHEC could require a RCRA Part B application with the change in waste stream.
• waste disposal	80	Treated waste form disposable as LLW.
<i>Public Acceptance</i>		
• public acceptance	50	Public approves of treatment that results in a glass waste form.
<i>Cost Considerations</i>		
• life cycle cost	98	
• funding availability	20	Unbudgeted.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 61 Total 75

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-1
Facility: M-Area Treatment Technology Vitrification
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 6	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 22	
1.3.2 Safety Assurance Documentation	\$ 6	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 5	
TOTAL PRE-OPERATIONS		\$ 313
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 24	
2.2 Inspection	\$ 7	
2.3 Project Management	\$ 12	
2.4 Building Construction (inc. indirect)	\$ 100	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 8	
2.7 Contingency	\$ 58	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 209
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 9	
3.2 Annual Utilities	\$ 0	
3.3 Annual Materials	\$ 5	
3.4 Annual Maintenance	\$ 3	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 18	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 5
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 1	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 10	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 10
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 10
SUB COST FOR VITRIFICATION MODULE		\$ 547
ESCALATION		1.23
TOTAL COST		\$ 673

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-2
Facility: Vendor/Onsite Treatment Technology Polymer Micro-encapsulation

Treatment Cycle Flow Diagram:

Pros

- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form meets shipping requirements in the form it exits the treatment process.
- Waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- This is a proven process, used both in DOE-complex and the commercial world.
- Mature technology. Vendor will bring onsite and set up with a minimum delay.
- Skid mounted, no D&D, vendor removes upon completion of work. Facility requires more non-operational workers than other comparably sized, skid mounted facilities.
- Must demonstrate that waste meets the treatment standards.
- The final waste will meet LDR treatment standards and can be disposed of as non-hazardous radioactive waste.

Cons

- The waste volume will more than double.
- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because the waste volume will more than double.
• secondary waste generation	80	Containers will require treatment by standard technology.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-2
Facility: Vendor/Onsite Treatment Technology Polymer Micro-encapsulation
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.
• final waste form	100	Waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because this is a proven process, used both in DOE-complex and the commercial world.
• availability	60	Add 10 points to the median score of 50 because system is normally available 50% of the time.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form can be ground up and reprocessed.
• schedule for treatment of waste	80	Mature technology. Vendor will bring onsite and set up with a minimum delay.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	70	Requires the same number of non-operational workers as comparable skid-mounted units. Most or all initial construction can be done in a vendor shop. Experience in similar facilities indicates that little non-routine maintenance is required. Subtract 10 points from median score of 80 because of uncertainties surrounding D&D efforts.
• operational worker potential exposure	40	Subtract 10 points from the median score of 50 because the facility requires more operational workers than other comparably sized, skid mounted facilities.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Full compliance expected without a variance.
• ability to obtain a permit	80	Must demonstrate that waste meets the treatment standards.
• waste disposal	80	The final waste will meet LDR treatment standards and can be disposed of as LLW.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	98	
• funding availability	20	Not a budgeted item, will require line item funding.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-2
Facility: Vendor/Onsite Treatment Technology Polymer Micro-
In-Depth Options Analysis Score Sheet encapsulation

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 59 Total 73

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-2
Facility: Vendor/Onsite Treatment Technology Polymer Micro-encapsulation
Cost Estimate Sheet

INCLUDE COST OF OPTION SR-W041A-3

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 3	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 14	
1.3.2 Safety Assurance Documentation	\$ 3	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 295
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 0	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 0	
2.7 Contingency	\$ 0	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 150	
3.2 Annual Utilities	\$ 6	
3.3 Annual Materials	\$ 90	
3.4 Annual Maintenance	\$ 54	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 300	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 75
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 1	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 135	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 135
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 25
SUB COST FOR POLYMER EMULSIFICATION MODULE		\$ 532
ESCALATION		1.06
TOTAL COST		\$ 563

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-3
Facility: CIF Treatment Technology Ashcrete

Treatment Cycle Flow Diagram:

Pros

- No secondary waste produced by Ashcrete.
- Waste stream is expected to meet all applicable LDR standards through this treatment.
- No abnormal shipping requirements.
- Controls in place to ensure adherence to final waste form requirements.
- Ashcrete is a current demonstrated technology.
- Reasonably easy to schedule this waste stream assuming current startup schedule.
- The metals in this waste stream will be captured in the ashcrete. Very little emissions.
- Expect average numbers compared to industrial complex construction and operation. No impact due to this waste stream.
- 100 of the final waste form expected to go to EAV. Waste not in contact with other waste streams.
- Line item is funded.

Cons

- The process is expected to increase volume by factor of 2.
- Waste form is not as permanent as other forms of stabilization.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because the process is expected to increase volume by factor of 2.
• secondary waste generation	100	Add 20 points to the median score of 80 because no secondary waste produced by Ashcrete.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because waste stream is expected to meet all applicable LDR standards through this treatment.
• flexibility	50	Waste handling of waste streams directly in ashcrete is an off-normal process, which lowers efficiency.
• ability to be shipped	80	No abnormal shipping requirements.
• final waste form	100	Add 20 points to the median score of 80 because controls in place to ensure adherence to final waste form requirements.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-3
Facility: CIF Treatment Technology Ashcrete
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because ashcrete is a current demonstrated technology.
• availability	50	Ashcrete availability. Normal maintenance requirements apply.
• scalability	50	Limited excess capacity exists.
• remedial measures	70	Subtract 10 points from the median score of 80 because the presence of metals in the final waste form might require rework.
• schedule for treatment of waste	80	Reasonably easy to schedule this waste stream assuming current startup schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	The metals in this waste stream will be captured in the ashcrete. Very little emissions.
• non-operational worker potential exposure	70	Subtract 10 points from the median score of 80 because expect average numbers compared to industrial complex construction and operation. No impact due to this waste stream.
• operational worker potential exposure	50	Increased operator handling due to this waste stream.
• transportation potential exposure	60	Add 10 points to the median score of 50 because waste requires transportation – but limited risk.
<i>Regulatory Parameters</i>		
• need for variance	80	Full compliance anticipated. No variance required.
• ability to obtain a permit	50	Minor permit modification required.
• waste disposal	80	100% of the final waste form expected to go to LLW disposal. Waste not in contact with other waste streams.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	94	
• funding availability	80	Line item is funded.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	50	Vendors have expressed interest in treating this waste stream.

IDOA Score: Technical 58 Total 71

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-3
Facility: CIF Treatment Technology Ashcrete
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 0	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 0	
1.3.2 Safety Assurance Documentation	\$ 0	
1.3.3 Permitting	\$ 1500	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 1650
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 0	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 0	
2.7 Contingency	\$ 0	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 9	
3.2 Annual Utilities	\$ 0	
3.3 Annual Materials	\$ 5	
3.4 Annual Maintenance	\$ 3	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 18	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 5
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 1	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 10
SUB COST FOR STABILIZATION MODULE		\$ 1665
ESCALATION		1.23
TOTAL COST		\$ 2048

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-4
Facility: Vendor/Onsite Treatment Technology Stabilization

Treatment Cycle Flow Diagram:

Pros

- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form can be easily shipped as-is.
- Waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- This is a proven process, used both in DOE-complex and the commercial world.
- Similar systems in the commercial nuclear industry experience availability of 80%.
- This is a mature technology. This process is not skid mounted as are other vendors.
- Requires fewer non-operational workers than comparably sized facilities. Experience in similar facilities indicates that little non-routine maintenance is needed.
- Treated waste will meet treatment standards and be disposed of as non-hazardous LLW.
- No variance required.

Cons

- The waste volume will more than double.
- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because the waste volume will more than double.
• secondary waste generation	80	Containers will require treatment by standard technology.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-4
Facility: Vendor/Onsite Treatment Technology Stabilization
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form can be easily shipped as-is.
• final waste form	100	Waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because this is a proven process, used both in DOE-complex and the commercial world.
• availability	80	Similar systems in the commercial nuclear industry experience availability of 80%.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form can be over-packed, or ground up and reprocessed.
• schedule for treatment of waste	70	This is a mature technology. Subtract 10 points from the median score of 80 because this process is not skid mounted as are other vendors.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	80	Requires fewer non-operational workers than comparably sized facilities. Experience in similar facilities indicates that little non-routine maintenance is needed.
• operational worker potential exposure	50	Facility requires about the same number of operational workers as comparably sized, skid mounted facilities.
• transportation potential exposure	50	Additional characterization needed. Waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Full compliance without a variance expected.
• ability to obtain a permit	50	Must demonstrate that waste meets the treatment standard.
• waste disposal	80	Treated waste will meet treatment standards and be disposed of as LLW.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	98	
• funding availability	20	Not a budgeted item, will require line item funding.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-4
Facility: Vendor/Onsite Treatment Technology Stabilization
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 58 Total 72

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-4
Facility: Vendor/Onsite Treatment Technology Stabilization
Cost Estimate Sheet

INCLUDES COST FOR OPTION SR-W041A-2

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 3	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 14	
1.3.2 Safety Assurance Documentation	\$ 3	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 295
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 0	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 0	
2.7 Contingency	\$ 0	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 150	
3.2 Annual Utilities	\$ 6	
3.3 Annual Materials	\$ 90	
3.4 Annual Maintenance	\$ 54	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 300	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 75
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 1	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 135	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 135
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 25
SUB COST FOR CEMENT STABILIZATION MODULE		\$ 532
ESCALATION		1.06
TOTAL COST		\$ 563

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-5
Facility: Containment Building Treatment Technology In-Drum Stab

Treatment Cycle Flow Diagram:

Pros

- Entire process takes place inside the final disposal container. Little or no secondary waste generated.
- No additional treatment is required to meet LDR.
- Waste form meets shipping requirements in the form it exits the treatment process.
- Waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- A system, which is now in cold stand-by might be easily adaptable to treatment of this waste stream.
- Process can be installed in a building with adequate emission controls.
- Process will be in full compliance with regulations without a variance.
- Treated waste will meet treatment standards and be disposed of as non-hazardous LLW.

Cons

- Waste is divided among containers and encapsulating material added, which will increase the amount of waste material going to storage.
- Waste form is not as permanent as other forms of stabilization.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Waste is divided among containers and encapsulating material added, which will increase the amount of waste material going to storage.
• secondary waste generation	80	Entire process takes place inside the final disposal container. Little or no secondary waste generated.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-5
Facility: Containment Building Treatment Technology In-Drum Stab
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• flexibility	50	Provided the material is compatible with cement stabilization, and is of such a size as to fit in the stabilization container, this process can handle it.
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.
• final waste form	100	Waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	80	A system, which is now in cold stand-by might be easily adaptable to treatment of this waste stream.
• availability	50	System is normally available 50% of the time.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form can be ground up and reprocessed or over packed.
• schedule for treatment of waste	40	Subtract 10 points from the median score of 50 because central technology is in cold stand-by, but ancillary containment building process will have to be designed. Installation in a containment building will add uncertainties.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	40	Maintenance of encapsulating material mixing equipment will require an average crew. Subtract 10 points from the median score of 50 because personal protective equipment needed for work in a containment building.
• operational worker potential exposure	40	An average crew is required to operate the equipment. Subtract 10 points from the median score of 50 because manual labor required to unload incoming boxes and stack waste in the encapsulation containers.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be in full compliance with regulations without a variance.
• ability to obtain a permit	50	Proven process that has been permitted elsewhere.
• waste disposal	80	Treated waste will meet treatment standards and be disposed of as non-hazardous LLW.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	96	
• funding availability	50	Not a budgeted item. May be covered by operating funds, but an increase in budget will be required.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-5
Facility: Containment Building Treatment Technology In-Drum Stab
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	20	Process is commercially available.
• private sector involvement	50	One qualified vendor has been identified who can treat this waste.

IDOA Score: Technical 51 Total 65

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-5
Facility: Containment Building Treatment Technology In-Drum Stab
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 11	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 45	
1.3.2 Safety Assurance Documentation	\$ 11	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 8	
TOTAL PRE-OPERATIONS		\$ 351
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 50	
2.2 Inspection	\$ 14	
2.3 Project Management	\$ 22	
2.4 Building Construction (inc. indirect)	\$ 175	
2.5 Equipment (inc. indirect)	\$ 50	
2.6 Construction Management	\$ 16	
2.7 Contingency	\$ 117	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 444
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 30	
3.2 Annual Utilities	\$ 1	
3.3 Annual Materials	\$ 18	
3.4 Annual Maintenance	\$ 11	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 60	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 15
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 180	
4.2 Closure, Post-Closure, Monitoring	\$ 1	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 181
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 25
SUB COST FOR STABILIZATION MODULE		\$ 1016
ESCALATION		\$ 1.23
TOTAL COST		\$ 1249

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-6
Facility: INEL/WEDF Treatment Technology Stabilization

Treatment Technology

The INEL WEDF Stabilization process provides treatments for aqueous and organic liquids and debris. The process stabilizes waste in a grout matrix to reduce leachability.

Pros

- No secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	No secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-6
Facility: INEL/WEDF
In-Depth Options Analysis Score Sheet
Treatment Technology Stabilization

Attribute	Score	Discussion/Notes
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon state approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the state will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the state's acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	20	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 65

Waste Stream Number & Name: SR-W031 Uranium/Chromium Solution
Option Number: SR-W031-6
Facility: INEL/WEDF Treatment Technology Stabilization
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 3
7.0 Transportation		\$ 18
8.0 Disposal		\$ 532
SUB COST FOR INCINERATOR MODULE		\$ 553
ESCALATION		1.06
TOTAL COST		\$ 586

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

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Summary Page

Waste Stream Number & Name: SR-W032 Mercury Contaminated Heavy Water

Background Information

This waste was generated in the Heavy Water Operations Laboratory during analytical testing where mercury (II) chloride was used in the testing procedure.

Volume

- Current volume through 09/30/93 is 9.6 m³.
- No future waste generation is expected because the laboratory has modified the test using mercury as a tracing agent since the test generated a mixed waste.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D009A (TCLP Hg) wastewater

LDR Treatment Standard

- D009 = concentration based standard - 0.2 mg/l

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level high is due to sample analysis results.

Radiological Characterization

- Calculated activity varies. Average reading is 290 nCi/g.
- Tritium is present.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for Mercury Contaminated Heavy Water is recycling in the D-Area Heavy Water Operations Facility through utilization of an Ion Exchange resin. Ion exchange and heavy water recycling processes exist in the D-Area facilities. SRS is currently developing a plan to treat SR-W032 prior to 10/95 to take advantage of the facility's processing capability prior to shutdown (scheduled for FY97). If treatment is completed prior to 10/95, this waste stream will be removed from the STP.

Treatment Justification

In-depth options analysis is not required for this waste stream since a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

Ion exchange and heavy water recycling processes exist in the D-Area facilities. SRS is currently developing a plan to treat SR-W032 prior to 10/95 to take advantage of the facility's processing capability prior to shutdown (scheduled for FY97). If treatment is completed prior to 10/95, this waste stream will be removed from the STP.

Waste Stream Number & Name: SR-W032 Mercury Contaminated Heavy Water
Facility: D-Area Treatment Technology Ion Exchange
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled

Module Location: SRS

Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ 0
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 52	
3.2 Annual Utilities	\$ 0	
3.3 Annual Materials	\$ 0	
3.4 Annual Maintenance	\$ 250	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 302	
X NUMBER OF YEARS OF OPERATION	.23	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 69
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 0
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$ 0
6.0 Offsite Treatment (DOE)		\$ 0
7.0 Transportation		\$ 0
8.0 Disposal		\$ 0
SUB COST FOR MODULE		\$ 69
ESCALATION		1.092
TOTAL COST		\$ 76

Summary Page

Waste Stream Number & Name: SR-W033 Thirds Waste <100 nCi/g TRU Rad

Background Information

The waste stream is composed primarily of solids such as booties, lab coats, floor sweepings, rags, labware, and other job control waste generated primarily through separation activities for plutonium production. The waste stream includes small amounts of transuranic waste from onsite laboratories.

Volume

- Current volume through 09/30/93 is 8.0 m³.
- Expected 1993-1997 volume will be 25 m³.

Waste Stream Composition

- Organic Debris

Waste Code

- D001C (Ignitable), D003D, D004A, D006A, D007A-D009A, D011A (TCLP metals), D018-19, D022-26 (characteristic organics), P012, P015, P048, P113, P120 (acutely toxic commercial chemical wastes), U002, U032, U052, U080, U133, U134, U144, U151, U154, U161, U209, U211, U220, U226, U239 (commercial chemical wastes)

LDR Treatment Standard

- D001C, D003D specified technology – DEACT and meet F039 standards
- D004, D006-D009, D011, P012, P048, U002, U032, U052, U080, U144, U151, U161, U209, U211, U220, U226, U239 concentration based standards = 0.025-160 mg/kg
- D018-D019, D022-D026 no treatment standards yet developed by EPA
- P015 specified technology = RMETL or RTHRM
- P113 specified technology = RTHRM or STABL
- P120 specified technology = STABL
- U133 specified technology = FSUBS, CHOXD, CHRED or INCIN
- U134 specified technology = ADGAS fb NEUTR or NEUTR
- U154 specified technology = FSUBS or INCIN
- Alternate debris technology can be applied.

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium based on the varying composition of the job waste as it is generated.

Radiological Characterization

- Total activity is 10-100 nCi/g
- Contains Pu²³⁸, Pu²³⁹, Pu²⁴⁰, Pu²⁴¹, Pu²⁴², Am²⁴¹, U²³³, H³, Co⁶⁰, Cs¹³⁷, and other isotopes (transuranics and alpha emitters)
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred option for Thirds Waste with Less Than 100 nCi/g Transuranic Radionuclides (TRU) is to develop a plan to further characterize this waste stream to determine what components are suitable for shipment to the Waste Isolation Pilot Plant (WIPP) as TRU waste and what portion can undergo option analysis for treatment as mixed low-level waste.

Treatment Justification

In-depth options analysis is not required for this waste stream. For further information on this waste stream, see the TRU Waste Management Section in Chapter 4, Volume II.

This waste stream does not meet the DOE definition of Transuranic waste; however, the heterogeneous nature of the waste makes a high confidence level determination of transuranic contamination problematic. Because of the exposure concerns due to alpha contamination from these waste streams if treated with other forms of mixed waste, it has been determined the conservative approach would be to manage this waste in the same manner as true Transuranic waste.

For this waste matrix, incineration is an appropriate technology; however, the possibility of creating TRU waste when incinerating low-level waste with high levels of TRU radionuclides causes a dilemma. As a result, the conservative approach taken is to manage this waste in the same manner as a true transuranic waste.

Summary Page – Initial Screening

Waste Stream Number & Name: SR-W034 Calcium Metal

Background Information

Material that is used in an FB-Line process and became slightly oxidized and offspecification. The waste is stored in four 55 gallon steel drums.

Volume

- Current volume through 09/30/93 is 0.8 m³.
- No future waste generation expected. Offspecification material was stored in an RMMA before it was discovered the material was unacceptable to use for its specified purpose. Current procedures for material handling has reduced the likelihood for this situation to recur.

Waste Stream Composition

- Reactive Metal

Waste Code

- D003D (water reactive) nonwastewater

LDR Treatment Standard

- Specified technology = Deactivation
- Alternate debris technology may be applied.

Waste Characterization

- Process knowledge was used to characterize the waste stream.
- Confidence level is high based on the fact that this is pure technical grade calcium metal.

Radiological Characterization

- Stored in an RMMA – not likely to be contaminated but confirmation difficult.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
ETF	Wastewater	ETF has no process to treat this waste unless the metal is pretreated.
CIF	Ashcrete	Ashcrete does not remove the characteristic organics. Resulting waste form would not meet LDR requirements.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W034 Calcium Metal

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W034-1	Cont. Bldg.	Water Oxidation	51	69	82	1642	√
SR-W034-2	Vendor	React with CO ₂	100	66	79	3284	
SR-W034-3	M-Area	Acid Bath	88	64	77	1267	
SR-W034-4	INEL/WEDF	Stabilization	*	51	65	173	
SR-W034-5	Vendor	Plasma Hearth	1				
SR-W034-6	Vendor	Vitrification	26				

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

Plasma Hearth Process by Vendor

Plasma Hearth Process by vendor was rejected because:

- Plasma hearth incineration is currently still in the laboratory. While prototypes may exist, they have no record of continuous reliable operation in industrial settings. Hence, Pm=0.9.
- Control of the process requires sophisticated computerized instrumentation. Hence, Pc=0.9.
- It is not expected for this technology to reach a level of reliability suitable for industrial application for 5-10 years.

Vitrification by Vendor (SR-W034-6)

Vitrification by vendor (SR-W034-6) was rejected because:

- The technology proposed has not been demonstrated even at bench scale. It was advanced by the vendor as an idea which the vendor would pursue, given funding. Hence, Pm=0.9.
- The complexity of converting an industrial facility to the treatment and disposal of mixed waste, as the vendor proposes, is great, and does not seem to be fully appreciated by the vendor. Hence, Pc=0.5.
- Process engenders safety concerns regarding calcium reacting without controls with water in a mixing tank before vitrification.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Calcium Metal waste stream is Wet Oxidation in an onsite containment building with further treatment at the F- & H- Effluent Treatment Facility (ETF).

This option treats the constituent of concern, calcium, by eliminating the hazardous characteristic, reactivity, by reacting it to calcium hydroxide in a containment building (laboratory).

This option is preferred because:

- Process employs simple straightforward chemical reaction.
- Reaction takes place in a carefully controlled laboratory setting

- Reaction products are non-hazardous and can be released to an outfall via a waste water treatment facility.
- No secondary waste is generated.

Treatability Study Requirements

This treatment employs a well known chemical property: elemental calcium reaction with warm water to form calcium hydroxide and hydrogen gas. Although no treatability studies will be required, laboratory scale, applied research will determine the process train needed to carry out the reaction.

Options Rejected During IDOA

Reaction of Calcium with Carbon Dioxide by a Vendor

Reaction of calcium with carbon dioxide by a vendor was rejected because:

- Process produces a solid waste that requires disposal as low-level waste.

Dissolving with Acid in M-Area

Dissolving with acid in M-Area was rejected because:

- Process employs nitric acid, causing additional concerns about personnel exposure and respiratory hazard.
- Process is more complex than preferred option, but offers no environmental, or technological, advantage.

Stabilization at INEL/WEDF

Stabilization at INEL/WEDF (encapsulating the waste with a grout matrix) was rejected because:

- Process does not eliminate hazardous characteristic (i.e. reactivity) of the waste.
- Final waste form will not meet LDR standards.

Waste Stream Number & Name: SR-W034 Calcium Metal
Option Number: SR-W034-1
Facility: Containment Building Treatment Technology Water Oxidation

Treatment Cycle Flow Diagram:

Pros

- Total volume will be discharged to outfall.
- Little secondary waste. Reactor will require disposal after processing is complete.
- No additional treatment is required to meet LDR.
- Will handle expected waste stream. The waste stream is not expected to vary.
- Treatment eliminates hazardous characteristic (i.e., reactivity).
- Meets the expected WAC for disposal. No additional secondary waste treatment is required. Waste form is disposable in the form in which it exits the process.
- Simple process employing a straightforward chemical reaction process.
- Lack of moving parts in the treatment process suggests that availability will be 80%.
- Simple process employing a straightforward chemical reaction process. No difficulty is expected in developing a schedule.
- Process has few moving parts. Little non-operational worker involvement will be required. D&D effort will consist of placing the reactor in a disposal container and shipping to LLW disposal.
- Operational worker exposure will be small. Radiation levels are scarcely above background.
- Process will be designed to comply with applicable regulations without seeking a variance.
- Process eliminates hazardous characteristic.
- Disposal of primary wastes will be discharged to outfall. Secondary waste can be decontaminated and disposed of as scrap.
- Because the process eliminates the hazardous characteristic, and the final waste form is Ca(OH)_2 , the public should have few concerns that cannot be resolved.

Cons

- Not a budgeted item, will require line item funding.
- H_2 gas evolved during the reaction must be controlled to reduce potential for a hydrogen fire.

Waste Stream Number & Name: SR-W034 Calcium Metal
Option Number: SR-W034-1
Facility: Containment Building Treatment Technology Water Oxidation
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	100	Add 20 points to the median score of 80 because total volume will be discharged to outfall.
• secondary waste generation	80	Little secondary waste. Reactor will require disposal after processing is complete.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Will handle expected waste stream. The waste stream is not expected to vary.
• ability to be shipped	80	Treatment eliminates hazardous characteristic (i.e., reactivity).
• final waste form	80	Meets the expected WAC for disposal. No additional secondary waste treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	80	Simple process employing a straightforward chemical reaction process.
• availability	80	Lack of moving parts in the treatment process suggests that availability will be 80%.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	80	Failed waste form would require re-treatment.
• schedule for treatment of waste	80	Simple process employing a straightforward chemical reaction process. No difficulty is expected in developing a schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	80	Process has few moving parts. Little non-operational worker involvement will be required. D&D effort will consist of placing the reactor in a disposal container and shipping to LLW disposal.
• operational worker potential exposure	80	Operational worker exposure will be small. Radiation levels are scarcely above background.
• transportation potential exposure	80	Little characterization of treated waste is needed.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be designed to comply with applicable regulations without seeking a variance.
• ability to obtain a permit	80	Process eliminates hazardous characteristic.
• waste disposal	80	Disposal of primary wastes will be discharged to outfall. Secondary waste can be decontaminated and disposed of as scrap.
<i>Public Acceptance</i>		
• public acceptance	80	Because the process eliminates the hazardous characteristic, and the final waste form is $\text{Ca}(\text{OH})_2$, the public should have few concerns that cannot be resolved.

Waste Stream Number & Name: SR-W034 Calcium Metal
Option Number: SR-W034-1
Facility: Containment Building Treatment Technology Water Oxidation
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Cost Considerations</i>		
• life cycle cost	95	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this material is not usually a waste.
• private sector involvement	50	Vendors have expressed interest in treating this waste.

IDOA Score: Technical 69 Total 82

Waste Stream Number & Name: SR-W034 Calcium Metal
Option Number: SR-W034-1
Facility: Containment Building Treatment Technology Water Oxidation
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 17	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 67	
1.3.2 Safety Assurance Documentation	\$ 17	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 5	
TOTAL PRE-OPERATIONS		\$ 380
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 77	
2.2 Inspection	\$ 17	
2.3 Project Management	\$ 22	
2.4 Building Construction (inc. indirect)	\$ 100	
2.5 Equipment (inc. indirect)	\$ 250	
2.6 Construction Management	\$ 25	
2.7 Contingency	\$ 173	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 663
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 35	
3.2 Annual Utilities	\$ 1	
3.3 Annual Materials	\$ 21	
3.4 Annual Maintenance	\$ 13	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 70	
X NUMBER OF YEARS OF OPERATION	0.75	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 53
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 280	
4.2 Closure, Post-Closure, Monitoring	\$ 0	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 280
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 0
SUB COST FOR WATER OXIDATION MODULE		\$ 1375
ESCALATION		1.194
TOTAL COST		\$ 1642

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W034 Calcium Metal

Option Number: SR-W034-2

Facility: Vendor

Treatment Technology React with CO_2

Treatment Cycle Flow Diagram:

Pros

- Little secondary waste. Reactor will require disposal after processing is complete.
- No additional treatment is required to meet LDR.
- Will handle expected waste stream. The waste stream is not expected to vary.
- Treatment eliminates hazardous characteristic (i.e., reactivity).
- Meets the expected WAC for disposal. No additional treatment secondary waste treatment is required. Waste form is disposable in the form in which it exits the process.
- Simple process employing a straightforward chemical reaction process.
- Lack of moving parts in the treatment process suggests that availability will be 80%.
- Failed waste form would require re-treatment.
- Simple process employing a straightforward chemical reaction. process. No difficulty is expected in developing a schedule.
- Process has no moving parts. Little non-operational worker involvement will be required. D&D effort will consist of placing the reactor in a disposal container and shipping to LLW disposal.
- Operational worker exposure will be small. Radiation levels are scarcely above background.
- Little characterization of treated waste is needed.
- Process will be designed to comply with applicable regulations without seeking a variance.
- Process eliminates hazardous characteristic.
- Because the process eliminates the hazardous characteristic, and the final waste form is CaCO_3 (i.e., limestone), the public should have few concerns that cannot be resolved.

Cons

- Not a budgeted item, will require line item funding.
- Final waste form requires disposal as LLW.

Waste Stream Number & Name: SR-W034 Calcium Metal

Option Number: SR-W034-2

Facility: Vendor

Treatment Technology React with CO₂

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of treated waste will be slightly greater than original volume, decrease in bulk density.
• secondary waste generation	80	Little secondary waste. Reactor will require disposal after processing is complete.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Will handle expected waste stream. The waste stream is not expected to vary.
• ability to be shipped	80	Treatment eliminates hazardous characteristic (i.e., reactivity).
• final waste form	80	Meets the expected WAC for disposal. No additional treatment secondary waste treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	80	Simple process employing a straightforward chemical reaction process.
• availability	80	Lack of moving parts in the treatment process suggests that availability will be 80%.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	80	Failed waste form would require re-treatment.
• schedule for treatment of waste	80	Simple process employing a straightforward chemical reaction process. No difficulty is expected in developing a schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	80	Process has no moving parts. Little non-operational worker involvement will be required. D&D effort will consist of placing the reactor in a disposal container and shipping to LLW disposal.
• operational worker potential exposure	80	Operational worker exposure will be small. Radiation levels are scarcely above background.
• transportation potential exposure	80	Little characterization of treated waste is needed.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be designed to comply with applicable regulations without seeking a variance.
• ability to obtain a permit	80	Process eliminates hazardous characteristic.
• waste disposal	80	Disposal of primary and secondary wastes will be as LLW.
<i>Public Acceptance</i>		
• public acceptance	80	Because the process eliminates the hazardous characteristic, and the final waste form is CaCO ₃ (i.e., limestone), the public should have few concerns that cannot be resolved.

Waste Stream Number & Name: SR-W034 Calcium Metal

Option Number: SR-W034-2

Facility: Vendor

Treatment Technology React with CO₂

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Cost Considerations</i>		
• life cycle cost	91	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Public Acceptance</i>		
• public acceptance	80	Because the process eliminates the hazardous characteristic, and the final waste form is CaCO ₃ (i.e., limestone), the public should have few concerns that cannot be resolved.
<i>Cost Considerations</i>		
• life cycle cost	91	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is a vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is a vendor process.

IDOA Score: Technical 66 Total 79

Waste Stream Number & Name: SR-W034 Calcium Metal
Option Number: SR-W034-2
Facility: Vendor Treatment Technology React with CO₂
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 60	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 239	
1.3.2 Safety Assurance Documentation	\$ 60	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 678
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 220	
2.2 Inspection	\$ 70	
2.3 Project Management	\$ 115	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 70	
2.7 Contingency	\$ 620	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2095
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 50	
3.2 Annual Utilities	\$ 2	
3.3 Annual Materials	\$ 30	
3.4 Annual Maintenance	\$ 18	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 100	
X NUMBER OF YEARS OF OPERATION	0.75	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 75
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 0	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 250	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 250
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 0
SUB COST FOR CaCO ₃ REACTION MODULE		\$ 3098
ESCALATION		1.06
TOTAL COST		\$ 3284

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W034 Calcium Metal

Option Number: SR-W034-3

Facility: M-Area

Treatment Technology Acid Bath

Treatment Cycle Flow Diagram:

Pros

- Volume reduction > 5:1.
- Expect full conversion to calcium nitrate, a non-hazardous form – no secondary waste.
- Expect 100% conversion to non-reactive material.
- Can treat more than one kind of metal. No equipment changes would be required.
- No shipping required.
- Liquid ends up NPDES outfall. Filtercake will meet LDR standards and disposal WAC.
- Have demonstrated on aluminum. Some concern about reactivity of calcium metal.
- >80% availability of system by experience.
- Few or no emissions even under accident conditions.
- No increase in non-operational worker crew.
- Fully in compliance without needing variance.
- Public approves of treatment that eliminates hazardous characteristic.

Cons

- Existing facility would be difficult to expand. Fixed by design, but operation is a one-time effort.
- Line item will require funding.
- It is a unique process. Metallic calcium not usually considered a waste.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	90	Add 10 points to the median score of 80 because volume reduction >5:1, and processed waste can go to outfall.
• secondary waste generation	100	Add 20 points to the median score of 80 because expect full conversion to calcium nitrate, a non-hazardous form – no secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because expect 100 conversion to non-reactive material.
• flexibility	90	Can treat more than one kind of metal. Add 10 points to the median score of 80 because no equipment changes would be required.
• ability to be shipped	90	Add 10 points to the median score of 80 because no shipping required.
• final waste form	100	Liquid discharged through an NPDES outfall. Add 20 points to the median score of 80 because filtercake will meet LDR standards and disposal WAC.

Waste Stream Number & Name: SR-W034 Calcium Metal
Option Number: SR-W034-3
Facility: M-Area Treatment Technology Acid Bath
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	70	Process has been demonstrated on aluminum. Subtract 10 points from the median score of 80 because some concern about reactivity of calcium metal.
• availability	80	>80% availability of system by experience.
• scalability	20	Existing facility would be difficult to expand. Fixed by design.
• remedial measures	80	Totally recoverable if problem.
• schedule for treatment of waste	50	DOE has directed facility to shut down. May not be available beyond 3 years.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few or no emissions even under accident conditions.
• non-operational worker potential exposure	80	No increase in non-operational worker crew.
• operational worker potential exposure	50	Some potential safety concerns about dissolving a reactive metal in a strong acid.
• transportation potential exposure	50	Limited number of waste transports required and no additional characterization is needed.
<i>Regulatory Parameters</i>		
• need for variance	80	Process in full compliance without needing variance.
• ability to obtain a permit	50	Straight forward process should present few concerns to regulators.
• waste disposal	60	Majority of waste is released to a permitted outfall. Subtract 20 points from the median score of 80 because filter cake must be disposed of in HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	80	Public approves of treatment that eliminates hazardous characteristic.
<i>Cost Considerations</i>		
• life cycle cost	96	
• funding availability	20	Line item will require funding.
<i>Industry Involvement</i>		
• market for technology	0	This is a unique process. Subtract 20 points from the median score of 20 because metallic calcium not usually considered a waste.
• private sector involvement	50	Vendors have expressed an interest.

IDOA Score: Technical 64 Total 77

Waste Stream Number & Name: SR-W034 Calcium Metal

Option Number: SR-W034-3

Facility: M-Area

Treatment Technology Acid Bath

Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled

Module Location: SRS

Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 14	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 56	
1.3.2 Safety Assurance Documentation	\$ 14	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 2	
TOTAL PRE-OPERATIONS		\$ 362
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 66	
2.2 Inspection	\$ 14	
2.3 Project Management	\$ 16	
2.4 Building Construction (inc. indirect)	\$ 50	
2.5 Equipment (inc. indirect)	\$ 250	
2.6 Construction Management	\$ 21	
2.7 Contingency	\$ 146	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 563
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 150	
3.2 Annual Utilities	\$ 6	
3.3 Annual Materials	\$ 90	
3.4 Annual Maintenance	\$ 54	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 300	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 75
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 0	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 0
SUB COST FOR ACID DISSOLUTION MODULE		\$ 1000
ESCALATION		1.267
TOTAL COST		\$ 1267

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W034 Calcium Metal

Option Number: SR-W034-4

Facility: INEL/WEDF

Treatment Technology Stabilization

Treatment Technology

The INEL WEDF Stabilization process provides treatments for aqueous and organic liquids and debris. The process stabilizes waste in a grout matrix to reduce leachability.

Pros

- No secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	No secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.

Waste Stream Number & Name: SR-W034 Calcium Metal

Option Number: SR-W034-4

Facility: INEL/WEDF

Treatment Technology Stabilization

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the States acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	20	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 65

Waste Stream Number & Name: SR-W034 Calcium Metal

Option Number: SR-W034-4

Facility: INEL/WEDF

Treatment Technology Stabilization

Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$ N/A
6.0 Offsite Treatment (DOE)		\$ 45
7.0 Transportation		\$ 18
8.0 Disposal		\$ 100
SUB COST FOR INCINERATOR MODULE		\$ 163
ESCALATION		1.06
TOTAL COST		\$ 173

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W034 Calcium Metal

Option Number: SR-W034-5

Facility: Vendor

Treatment Technology Plasma Hearth

Option rejected during technical success factor evaluation. No further analysis performed.

Summary Page

Waste Stream Number & Name: SR-W035 Freon 11/Oil Mixture

Background Information

Waste generated from a preventative maintenance program for changing the refrigeration oil in some of the Separations Area chillers. Routinely, this is a nonradioactive used oil that could be recycled for energy recovery. However, these nine drums had detectable levels of tritium (H^3) which prevented recycling. Contaminants in the Freon (D019, D039, D040) also have been determined to make the freon 11/oil hazardous. Therefore, the waste is characterized as mixed waste.

Volume

- Current volume through 09/30/93 is 2.0 m³.
- No future waste generation is expected because this was a one time generation.

Waste Stream Composition

- Organic Liquid

Waste Code

- D019 (carbon tetrachloride), D022 (chloroform), D039 (tetrachloroethylene), D040 (trichloroethylene)

LDR Treatment Standard

- No treatment standards yet developed by EPA for these D-codes.

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high because of TCLP results.
- TCLP has been run on nonradioactive Freon 11 but not on radioactive Freon 11.

Radiological Characterization

- Typical activity is 8.75×10^{-2} nCi/g.
- Tritium present in waste stream.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for the Freon 11/Oil waste stream is Incineration in the Consolidated Incineration Facility (CIF).

Treatment Justification

In-depth options analysis was not performed for this waste stream.

During development of the Consolidated Incineration Facility (CIF) design basis, a determination was made of the types and volumes of hazardous, low level radioactive, and mixed Savannah River Site (SRS) waste streams that would be generated in the future or were in storage for which treatment by incineration would be beneficial. The determination to initiate development of CIF was based on the facts that incineration was recommended or required by environmental regulations and a significant volume or toxicity reduction would be achieved. The waste amenable to incineration were grouped by physical state, solid or liquid, and type of contamination, hazardous and/or radioactive. Some wastes such as Defense Waste Processing Facility benzene and low level radioactive job control waste were individually designated a waste group. The waste groups and current/future volume data were adopted as a design basis for the CIF Functional Performance Requirements (FPR), OPS-WMP-90-4140. The FPR serves as the baseline design document for the initiation of project development at the SRS.

Based on physical and chemical characteristics, the SRS Mixed wastes already designated for treatment at the CIF fall into one of the CIF design basis waste groups listed as follows:

FPR Waste Group

Beta/Gamma Boxed (Solid)

High BTU (Liquid)

Chlorinated (Liquid)

DWPF Organic

Naval Fuel Organic

SRS Mixed Waste Streams

Solvent Contaminated Debris (SR-W003)

Toxic Clean Up Material (SR-W012)

Scintillation Solution (SR-W010)

Radioactive Contaminated Solvents (SR-W001)

Radioactive Contaminated

Chlorofluorocarbons (SR-W002)

Freon 11/Oil (SR-W035)

DWPF Benzene (SR-W022)

Spent Methanol (SR-W030)

Some of the CIF design basis waste groups listed in the table are designated in the FPR as nonradioactive hazardous waste. The radioactive nature of the waste does not impact its combustion characteristics. The operation and efficiency of the CIF combustion and air pollution control systems are not influenced by the presence of radioactivity. A mixed waste that meets the chemical and physical criteria of a design basis nonradioactive waste group can be treated in the CIF as effectively as the nonradioactive waste.

The CIF Mission Need and Design Capacity Review (07/07/93) and the supporting Alternative Treatment Technologies for SRS Hazardous, Mixed and Job Control Wastes (SWE-CIF-93020, 07/29/93) reevaluated the treatment of certain existing and future SRS wastes in the CIF. The review was structured to generally reexamine the appropriateness of each FPR design basis waste group and additional mixed waste groups that are not listed in the FPR but are chemically and physically similar to an FPR nonradioactive waste group. The review compared the incineration of each waste group to treatment by other candidate technologies using comparison criteria such as waste volume and toxicity reduction, treatment and disposal costs, and RCRA Land Disposal Restriction requirements. The review program concluded that the waste groups originally designated for CIF and the additional mixed waste groups are most effectively treated by incineration.

Alternative Technologies Investigated

Chemical Oxidation

Chemical oxidation involves the addition of a chemical oxidizing agent, such as ozone, to the waste stream. The organic material in the waste is oxidized to carbon dioxide and water vapor. The offgas would be passed through carbon filters to remove any volatile organic vapors generated. This process has not been used to treat concentrated organic waste streams. Formation of incomplete oxidation by-products would be difficult to prevent. The time required for complete oxidation of the waste could be unacceptably long. Also, this treatment has not been demonstrated or developed for this waste stream. Until such technology development work is completed, this technology is not considered a viable treatment alternative for this waste type.

Selected Treatment Technology

Since no acceptable alternative treatment technology for this waste was identified, the selected technology is incineration followed by stabilization of the residuals. Incineration destroys organic constituents, generates a residual which is easily stabilized, and significantly reduces the waste volume requiring permanent disposal. With increased concerns over release of freon to the environment, a treatment technology that destroys freon, instead of stabilizing it for disposal, was considered essential. Incineration, or thermal oxidation, is the technology typically used for treatment of this waste type.

Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE STREAM SR-W001. SEE COST ESTIMATE SHEET FOR SR-W001.

Summary Page – Initial Screening

Waste Stream Number & Name: SR-W036 Radioactive Oil

Background Information

This waste stream consists of used oil from pumps and compressors in the Tritium Facility that are contaminated with tritium and possibly mercury. Reliable characterization is hindered by personnel exposure concerns and by potential scintillation counting interferences caused by the oil. The potential for mercury contamination is known but not quantified.

Volume

- Current volume through 09/30/93 is 17.2 m³.
- Expected 1993-1997 volume will be 1.6 m³.

Waste Stream Composition

- Organic Liquid

Waste Code

- D009E (hydraulic oil contaminated with Hg and radioactive materials)

LDR Treatment Standard

- Specified technology – Incineration of wastes containing organics and mercury

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is low based on the fact that, waste cannot be sampled for mercury level due to ALARA concerns.

Radiological Characterization

- Calculated values for 473 liters that are <1.0 nCi/ml, 355 liters that are 1 to 500 nCi/ml, 49 liters that are 1,000 to 10,000 uCi/ml, 151 liters that are above 10,000 uCi/ml.
- Tritium present.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Ashcrete	Ashcrete does not have the facilities to mix oil with cement.
CIF	Incineration	This oil contains more curies of radioactivity than CIF's permit will allow.
ETF	Wastewater	ETF has no process to treat oil waste.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
LETF	Wastewater	Oil contains more curies of radioactivity than LETFs permit will allow. Also, LETF has no equipment to treat oil.
M-Area	Vitrification	Oil contains more curies that vitrifier can handle. Vitrifier not configured for liquid waste feed.

Initial Rejections (contd)

Treatment Facility	Treatment Technology	Reasons for Rejection
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.
Vendor	Thermal Destruction	This option is rejected because the vendor's permit will not allow incineration of waste with this level of radioactivity to be incinerated there.
INEL/WEDF	Stabilization	This option was rejected because of: <ul style="list-style-type: none">• Uncertainties surrounding the process for stabilizing large volumes of oil.• Increase in volume of material requiring disposal.
INEL/WERF	Incineration	This option is rejected because the WERF permit will not allow incineration of material with this level of radioactivity.

Preferred Option Justification

The preferred treatment option has not been determined for the Radioactive Oil. This waste stream has three viable options: 1) undergo technology development to identify an acceptable method; 2) pretreatment by aging, followed by incineration and stabilization; and 3) treatability variance to allow disposal in the HW/MW Disposal Facility as it is currently packaged. Meanwhile, waste will remain in storage, while the tritium continues to decay.

- The pretreatment by aging option allows the tritium to decay naturally to a manageable level.

Summary Page

Waste Stream Number & Name: SR-W037 M-Area High Nickel Plating Line Sludge

Background Information

This waste stream is an inorganic sludge generated from the treatment of M-Area production wastewaters containing elevated quantities of metals (mostly nickel) in the M-Area Dilute LETF. The sludge is currently stored in the Process Waste Interim Treatment/Storage Facility (PWIT/SF). On June 28, 1994 waste stream SR-W054, Enriched Uranium Contaminated with Lead, was added to this waste stream. A study has shown that M-Area Vendor Treatment Process can treat the SR-W054 waste to meet treatment standards for lead. However, since the lead in SR-W054, is also a component that is found in F006, and since the F006 treatment standard for lead is lower, the waste code for SR-W054 is not listed here.

Volume

- Current volume through 09/30/93 is 1190 m³.
- No future waste generation expected because manufacturing process which generated this waste is no longer operational.

Waste Stream Composition

- Inorganic Sludge/Particulate

Waste Code

- F006 (metal plating line waste, without cyanide) nonwastewater

LDR Treatment Standard

- Concentration based standards 0.066-5.2 mg/l

Waste Characterization

- Process knowledge and sampling and analysis used to characterize the waste.
- Confidence level high based on availability of analytical results and knowledge that the process generates a listed hazardous waste.

Radiological Characterization

- Total activity is 11.05 Ci.
- Alpha emitters are U²³⁴, U²³⁵, U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for M-Area Nickel Plating Line Sludge is Vitrification in the M-Area Vendor Treatment Process.

Treatment Justification

In-depth options analysis is not required for this waste stream since a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

The proposed action is to stabilize the M-Area mixed wastes utilizing a thermal vitrification process. The process facility would be constructed and operated by a subcontractor to the Westinghouse Savannah River Company. The vitrification process would result in the lowest volume of stabilized waste for final disposal, provide the most durable final waste form, and could be completed for the lowest cost (including final disposal costs) of all treatment alternatives for wastes needing to be treated in M-Area.

The proposed action was evaluated with respect to the technical ability to meet the Land Disposal Restriction criteria for the final stabilized waste form, and for the overall cost of the treatment activities. The ability to meet the durability requirements, that is, Toxicity

Characteristic Leaching Procedure (TCLP) testing requirements, for constituents of concern in the final waste form was a critical consideration. The total life cycle cost, including the cost of treating the waste itself, the cost to treat any effluents generated by the vendor, and the cost to dispose of the final waste form were also considered. In addition, the environmental impacts, onsite and offsite health effects, and occupational health and safety concerns for this treatment method were evaluated.

Treatability studies were performed on M-Area waste streams to determine the treatment technology most likely to meet the treatment standard required in the land disposal restriction standards. Methods determined to be most effective in meeting the treatment standards involved the isolation of the metal contaminants in a cementitious or a glass matrix. Investigation was made into the alternatives for providing such treatment. Treatment options investigated included:

- onsite treatment by a subcontractor at a temporary facility
- onsite treatment at a permanent facility located in M-Area and operated by SRS
- onsite treatment at a permanent facility located at some central SRS location and operated by SRS
- transport to an offsite location for treatment by a vendor
- taking no action

The no action alternative was rejected because of the LDR-FFCA requirement for treatment of the M-Area waste streams.

Evaluation of the treatment option was made for both a cement based stabilization process and a glass/vitrification process. An initial determination was made that vendor processes were cheaper than construction and operation of a permanent, onsite facility by SRS. Cost studies performed in 1991 showed that onsite treatment in facilities constructed at SRS would cost an estimated 46 million dollars if constructed in M-Area or 75 million if constructed at a central SRS location. A vendor operated cementitious waste stabilization treatment process would cost 28 million dollars. A request for bids was made to vendors utilizing both cement and glass isolation processes. A stipulation was made in the bid that the vendor must demonstrate that this process was capable of meeting the land disposal restriction treatment standards for the waste streams to receive treatment at M-Area.

The award of a contract for the treatment of M-Area waste was based on demonstration on the part of the bidder of not only a technically valid treatment process, previous treatment experience, and adequate company resources to carry out the work.

Review of the bids determined that the proposal for treating M-Area Wastes by vitrification in a temporary facility operated at SRS by a vendor was the lowest cost alternative. This alternative would also result in the least amount of liquid requiring treatment and discharge at the M-Area wastewater treatment facility and produce the lowest volume of treated waste meeting land disposal restriction standards that would require eventual disposal in a RCRA disposal facility.

When blending and treatment of the Intermediate Treatment/Storage Facility sludge is begun, it is projected that approximately 700,000 gallons of F006 listed mixed waste will be in storage in the tanks. This includes an estimated 50,000 gallons of supernate which cannot be separated from the sludge. Waste streams stored in the tanks include M-Area Plating Line Sludges from Supernate Treatment, SR-W004; M-Area High Nickel Plating Line Sludge, and SR-W037. One waste stream (SR-W054 -- analytical laboratory residue, total volume 35 gallons) has been combined with waste stream SR-W037. SR-W054 is now indistinguishable from form SR-W037 and will be treated identically.

Other M-Area mixed wastes to be treated are stored in 55 gallon drums in the Mixed Waste Storage Shed in M-Area. These wastes include:

- A Watts Plating bath, California list waste solution, SR-W039, Nickel Plating Line Solution
- Mark 15 sludge filter cake, waste stream SR-W005, Mark 15 Filter Cake
- Solid treatability sample residues, waste stream SR-W029, M-Area Sludge Treatability Samples

Two drums of Plating Line Sump Material (SR-W038) are stored in the 645-2N storage facility.

Equipment required for treatment of the M-Area waste would continue to belong to the vendor and, if the equipment could meet Department of Transportation shipping criteria for radioactivity, would be removed from SRS. If equipment could not be successfully decontaminated, it would be disposed of onsite. The cost of disposal was a part of the total contract cost.

The M-Area Vendor Treatment Process is capable of effectively treating all of these waste streams to meet regulatory requirements. As a result, upon completion of treatment, all listed and characteristically hazardous waste sludges and liquids from M-Area operations will be eliminated.

Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE STREAM SR-W004. SEE COST ESTIMATE SHEET FOR SR-W004.

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Summary Page

Waste Stream Number & Name: SR-W038 **Plating Line Sump Material**

Background Information

A mixed waste stream generated as a one time clean out of the sump at a building in M-Area.

Volume

- Current volume through 09/30/93 is 0.4 m³.
- No future waste generation expected because manufacturing process which generated this waste is no longer operational.

Waste Stream Composition

- Inorganic Sludge

Waste Code

- D007A (TCLP Cr) nonwastewater

LDR Treatment Standard

- D007A = concentration based standard – 5.0 mg/l

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level high based on availability of analytical results.

Radiological Characterization

- Total activity is less than 10 nCi/g.
- Alpha emitters are U²³⁴, U²³⁵, and U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for M-Area Plating Line Sump Material is vitrification in the M-Area Vendor Treatment Process.

Treatment Justification

In-depth options analysis is not required for this waste stream since a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

The proposed action is to stabilize the M-Area mixed wastes utilizing a thermal vitrification process. The process facility would be constructed and operated by a subcontractor to the Westinghouse Savannah River Company. The vitrification process would result in the lowest volume of stabilized waste for final disposal, provide the most durable final waste form, and could be completed for the lowest cost (including final disposal costs) of all treatment alternatives for wastes needing to be treated in M-Area.

The proposed action was evaluated with respect to the technical ability to meet the Land Disposal Restriction criteria for the final stabilized waste form, and for the overall cost of the treatment activities. The ability to meet the durability requirements, that is, Toxicity Characteristic Leaching Procedure (TCLP) testing requirements, for constituents of concern in the final waste form was a critical consideration. The total life cycle cost, including the cost of treating the waste itself, the cost to treat any effluents generated by the vendor, and the cost to dispose of the final waste form were also considered. In addition, the environmental impacts, onsite and offsite health effects, and occupational health and safety concerns for this treatment method were evaluated.

Treatability studies were performed on M-Area waste streams to determine the treatment technology most likely to meet the treatment standard required in the land disposal restriction standards. Methods determined to be most effective in meeting the treatment standards involved the isolation of the metal contaminants in a cementitious or a glass matrix. Investigation was made into the alternatives for providing such treatment. Treatment options investigated included:

- onsite treatment by a subcontractor at a temporary facility
- onsite treatment at a permanent facility located in M-Area and operated by SRS
- onsite treatment at a permanent facility located at some central SRS location and operated by SRS
- transport to an offsite location for treatment by a vendor
- taking no action

The no action alternative was rejected because of the LDR-FFCA requirement for treatment of the M-Area waste streams.

Evaluation of the treatment option was made for both a cement based stabilization process and a glass/vitrification process. An initial determination was made that vendor processes were cheaper than construction and operation of a permanent, onsite facility by SRS. Cost studies performed in 1991 showed that onsite treatment in facilities constructed at SRS would cost an estimated 46 million dollars if constructed in M-Area or 75 million if constructed at a central SRS location. A vendor operated cementitious waste stabilization treatment process would cost 28 million dollars. A request for bids was made to vendors utilizing both cement and glass isolation processes. A stipulation was made in the bid that the vendor must demonstrate that this process was capable of meeting the land disposal restriction treatment standards for the waste streams to receive treatment at M-Area.

The award of a contract for the treatment of M-Area waste was based on demonstration on the part of the bidder of not only a technically valid treatment process, previous treatment experience, and adequate company resources to carry out the work.

Review of the bids determined that the proposal for treating M-Area Wastes by vitrification in a temporary facility operated at SRS by a vendor was the lowest cost alternative. This alternative would also result in the least amount of liquid requiring treatment and discharge at the M-Area wastewater treatment facility and produce the lowest volume of treated waste meeting land disposal restriction standards that would require eventual disposal in a RCRA disposal facility.

When blending and treatment of the Intermediate Treatment/Storage Facility sludge is begun, it is projected that approximately 700,000 gallons of F006 listed mixed waste will be in storage in the tanks. This includes an estimated 50,000 gallons of supernate which cannot be separated from the sludge. Waste streams stored in the tanks include M-Area Plating Line Sludges from Supernate Treatment, SR-W004; M-Area High Nickel Plating Line Sludge, and SR-W037. One waste stream (SR-W054 – analytical laboratory residue, total volume 35 gallons) has been combined with waste stream SR-W037. SR-W054 is now indistinguishable from SR-W037 and will be treated identically.

Other M-Area mixed wastes to be treated are stored in 55 gallon drums in the Mixed Waste Storage Shed in M-Area. These wastes include:

- A Watts Plating bath, California list waste solution, SR-W039, Nickel Plating Line Solution
- Mark 15 sludge filter cake, waste stream SR-W005, Mark 15 Filter Cake
- Solid treatability sample residues, waste stream SR-W029, M-Area Sludge Treatability Samples

Two drums of Plating Line Sump Material (SR-W038) are stored in the 645-2N storage facility.

Equipment required for treatment of the M-Area waste would continue to belong to the vendor and, if the equipment could meet Department of Transportation shipping criteria for radioactivity, would be removed from SRS. If equipment could not be successfully decontaminated, it would be disposed of onsite. The cost of disposal was a part of the total contract cost.

The M-Area Vendor Treatment Process is capable of effectively treating all of these waste streams to meet regulatory requirements. As a result, upon completion of treatment, all listed and characteristically hazardous waste sludges and liquids from M-Area operations will be eliminated.

**Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE
STREAM SR-W004. SEE COST ESTIMATE SHEET FOR SR-W004.**

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Summary Page

Waste Stream Number & Name: SR-W039 Nickel Plating Line Solution

Background Information

This waste is plating line solution generated by the shut down of the M-Area process line.

Volume

- Current volume through 09/30/93 is 5.0 m³.
- No future waste generation expected because the manufacturing process which generated this waste is no longer operational.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D002A (corrosive), D008A (TCLP Pb) wastewater

LDR Treatment Standard

- D002A = specified technology – Deactivation
- D008A concentration based standard – 5.0 mg/l
- California list = render non-liquid

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high because EP toxicity test was run.
- No TCLP was performed.
- Primary contaminant Ni with trace amounts of Pb.

Radiological Characterization

- Total activity is 6.56×10^{-5} Ci
- Alpha emitters are U²³⁴, U²³⁵, and U²³⁸.
- Waste is contact handled.
- Mixed low-level waste

Preferred Option

The preferred treatment option for M-Area Nickel Plating Line Solution is Vitrification in the M-Area Vendor Treatment Process.

Treatment Justification

In-depth options analysis is not required for this waste stream since a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

The proposed action is to stabilize the M-Area mixed wastes utilizing a thermal vitrification process. The process facility would be constructed and operated by a subcontractor to the Westinghouse Savannah River Company. The vitrification process would result in the lowest volume of stabilized waste for final disposal, provide the most durable final waste form, and could be completed for the lowest cost (including final disposal costs) of all treatment alternatives for wastes needing to be treated in M-Area.

The proposed action was evaluated with respect to the technical ability to meet the Land Disposal Restriction criteria for the final stabilized waste form, and for the overall cost of the treatment activities. The ability to meet the durability requirements, that is, Toxicity Characteristic Leaching Procedure (TCLP) testing requirements, for constituents of concern in the final waste form was a critical consideration. The total life cycle cost, including the cost of treating the waste itself, the cost to treat any effluents generated by the vendor, and the cost to dispose of the final waste form were also considered. In addition, the

environmental impacts, onsite and offsite health effects, and occupational health and safety concerns for this treatment method were evaluated.

Treatability studies were performed on M-Area waste streams to determine the treatment technology most likely to meet the treatment standard required in the land disposal restriction standards. Methods determined to be most effective in meeting the treatment standards involved the isolation of the metal contaminants in a cementitious or a glass matrix. Investigation was made into the alternatives for providing such treatment. Treatment options investigated included:

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- taking no action

The no action alternative was rejected because of the LDR-FFCA requirement for treatment of the M-Area waste streams.

Evaluation of the treatment option was made for both a cement based stabilization process and a glass/vitrification process. An initial determination was made that vendor processes were cheaper than construction and operation of a permanent, onsite facility by SRS. Cost studies performed in 1991 showed that onsite treatment in facilities constructed at SRS would cost an estimated 46 million dollars if constructed in M-Area or 75 million if constructed at a central SRS location. A vendor operated cementitious waste stabilization treatment process would cost 28 million dollars. A request for bids was made to vendors utilizing both cement and glass isolation processes. A stipulation was made in the bid that the vendor must demonstrate that this process was capable of meeting the land disposal restriction treatment standards for the waste streams to receive treatment at M-Area.

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When blending and treatment of the Intermediate Treatment/Storage Facility sludge is begun, it is projected that approximately 700,000 gallons of F006 listed mixed waste will be in storage in the tanks. This includes an estimated 50,000 gallons of supernate which cannot be separated from the sludge. Waste streams stored in the tanks include M-Area Plating Line Sludges from Supernate Treatment, SR-W004; M-Area High Nickel Plating Line Sludge, and SR-W037. One waste stream (SR-W054 - analytical laboratory residue, total volume 35 gallons) has been combined with waste stream SR-W037. SR-W054 is now indistinguishable from form SR-W037 and will be treated identically.

Other M-Area mixed wastes to be treated are stored in 55 gallon drums in the Mixed Waste Storage Shed in M-Area. These wastes include:

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- Mark 15 sludge filter cake, waste stream SR-W005, Mark 15 Filter Cake

- Solid treatability sample residues, waste stream SR-W029, M-Area Sludge Treatability Samples

Two drums of Plating Line Sump Material (SR-W038) are stored in the 645-2N storage facility.

Equipment required for treatment of the M-Area waste would continue to belong to the vendor and, if the equipment could meet Department of Transportation shipping criteria for radioactivity, would be removed from SRS. If equipment could not be successfully decontaminated, it would be disposed of onsite. The cost of disposal was a part of the total contract cost.

The M-Area Vendor Treatment Process is capable of effectively treating all of these waste streams to meet regulatory requirements. As a result, upon completion of treatment, all listed and characteristically hazardous waste sludges and liquids from M-Area operations will be eliminated.

Cost Estimate: INCLUDED WITH COST INFORMATION FOR TREATING WASTE STREAM SR-W004. SEE COST ESTIMATE SHEET FOR SR-W004.

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Summary Page

Waste Stream Number & Name: SR-W040 M-Area Stabilized Sludge

Background Information

A future waste stream resulting from vitrification of M-Area waste plating line solutions and sludges after vitrification in the M-Area Vendor Treatment Process.

This future waste stream will be in its final stabilized form following vitrification. Since additional treatment is not required, no further tracking of this waste stream will be provided. This waste stream will be deleted from the Mixed Waste Inventory Report and the Site Treatment Plan.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead

Background Information

In the MWIR, SR-W041 is reported as a single waste stream, mainly due to the fact that it is all in one drum. However, when evaluation of the waste streams for treatment options began, it was recognized that the stream should be divided into its three distinct components. Thus, the stream numbers have been changed with the addition of an A, B, or C suffix. This portion of the waste stream consists of one 6 liter and one 2 liter bottle of aqueous mercury and one 4 liter bottle of aqueous lead. This waste was generated from analytical support for the Naval Fuels Development Facility (779-A).

Volume

- Current volume through 09/30/93 is 0.09 m³.
- No future waste generation is expected because waste was generated from a one time cleanout of a laboratory, which is no longer operational.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- D008A (TCLP Pb) wastewater
- D009C (High Hg contains inorganics) wastewater

LDR Treatment Standard

- D008A = concentration based standard, 5.0 mg/l
- D009C = specified technology – RMERC

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Sampling and analysis for mercury is available because confidence level is high.

Radiological Characterization

- Sampling and analysis indicates the average activity level is 2.9 nCi/g.
- Beta/gamma emitter, alpha emitter, U²³⁸, tritium present.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Combustion	CIF has no equipment to control Hg vapors.
CIF	Ashcrete	Ashcrete will not immobilize the constituents of concern to pass TCLP.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.
M-Area	Vitrification	Vitrifier has no provision to control volatilized Hg.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W041A-1	ETF	Ion Exchange	94	65	79	307	√
SR-W041A-2	Vendor/Onsite	Stabilization	75	59	73	SR-W031-4	
SR-W041A-3	Vendor/Onsite	Polymer Encapsulation	88	59	73	SR-W031-2	
SR-W041A-4	Cont. Bldg.	In-Drum Stabilization	51	54	67	1249	
SR-W041A-5	Vendor	Precipitation	88	45	57	4590	
SR-W041A-6	INEL/WEDF	Stabilization	*	51	65	377	

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

- No options were rejected.

Engineering Assessment

Preferred Option Justification

The preferred option for the Aqueous Mercury and Lead waste stream is treatment in the F- and H-Effluent Treatment Facility using Ion Exchange.

This option treats the constituents of concern, aqueous lead and mercury, by adsorption on ion exchange resin.

This option is preferred because:

- Final waste volume is reduced by a factor of more than 20 to 1.
- The constituents of concern are adsorbed so tightly on the resin, the resin meets LDR.
- ETF has successfully treated wastes to this type before.
- Treated liquid effluent can ultimately be released to a permitted outfall.

Treatability Study Requirements

A representative sample of the material will be mixed with ion exchange resin in the laboratory to determine:

- Mercury and lead removal from the liquid stream.
- Ability of the resin to bind with mercury and lead to that the resin meets LDR requirements.

Options Rejected During IDOA

Emulsification or Stabilization by a Vendor in a Containment Building

Emulsification or stabilization by a vendor in a containment building was rejected because:

- Rejected processes are not cost effective.
- Minute volume of waste does not warrant a complex treatment process, which offers no technological advantage over preferred option.

Stabilization at INEL/WEDF

Stabilization at INEL/WEDF (encapsulating the waste with a grout matrix) was rejected because:

- Rejected process is not cost effective.
- Minute volume of waste does not warrant a complex treatment process, which offers no technological advantage over preferred option.
- DOE guidance specifies that liquid waste be treated onsite.

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead

Option Number: SR-W041A-1

Facility: ETF

Treatment Technology Ion Exchange

Treatment Cycle Flow Diagram:

Pros

- Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load. Normal availability >80%.
- Expect >20:1 reduction. Liquid goes to outfall.
- No secondary waste generated. No increase in secondary waste attributable to this waste.
- Expect 100% conversion to non-hazardous form.
- Can treat with no changes to process, main line or evaporator.
- No shipping required. Released to outfall.
- Resins do not require RCRA disposal.
- This is an already proven technology. Process is installed and operational.
- All wastes are batched and analyzed before release.
- Existing equipment. Permission from SCDHEC predictable based on past experience.
- Small waste stream. Minimal emissions even during accident scenarios.
- No increase in non-operational work force.
- No change in operational work force. Slight potential for exposure while emptying bottles.
- Expect treatment to render waste form in full compliance with LDR.
- This can be done with no increase in operating budget.

Cons

- Aqueous Hg waste contains >260mg/kg Hg, but mercury is not suspended elemental Hg. Thus, the specified EPA treatment technology (roast and retort) is not appropriate. A treatability variance will be required to use ion exchange treatment.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	90	Add 10 points to the median score of 80 because expect >20:1 reduction. Liquid goes to outfall.
• secondary waste generation	100	No secondary waste generated. Add 20 points to the median score of 80 because no increase in secondary waste attributable to this waste.
• destruction removal and demobilization efficiency	80	Expect 100% conversion to non-hazardous form.
• flexibility	80	Can treat with no changes to process, main line or evaporator.
• ability to be shipped	80	No shipping required. Released to outfall.
• final waste form	80	Resins pass TCLP.

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead
Option Number: SR-W041A-1
Facility: ETF Treatment Technology Ion Exchange
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	100	This is an already proven technology. Add 20 points to the median score of 80 because process is installed and operational.
• availability	80	Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load. Normal availability >80%.
• scalability	50	Can handle this small volume stream easily.
• remedial measures	80	All wastes are batched and analyzed before release.
• schedule for treatment of waste	80	Existing equipment. Permission from SCDHEC expected based on past experience.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Small waste stream. Minimal emissions even during accident scenarios.
• non-operational worker potential exposure	80	No increase in non-operational work force.
• operational worker potential exposure	70	No change in operational work force. Subtract 10 points from the median score of 80 because slight potential for exposure while emptying bottles.
• transportation potential exposure	80	None required.
<i>Regulatory Parameters</i>		
• need for variance	20	Expect treatment to render waste form in full compliance with LDR, but treatability variance will be required.
• ability to obtain a permit	80	Will require SCDHEC approval, but Site has experience with these requests.
• waste disposal	80	Solid waste (resin) will require LLW disposal. Treated liquid waste will go to a permitted outfall.
<i>Public Acceptance</i>		
• public acceptance	50	Good public acceptance 5 years ago, no indication that support has eroded in the meanwhile.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	100	Add 20 points to the median score of 80 because this can be done with no increase in operating budget.
<i>Industry Involvement</i>		
• market for technology	20	Application of existing technology.
• private sector involvement	50	Vendors have expressed interest in treating this waste.

IDOA Score: Technical 65 Total 79

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead
Option Number: SR-W041A-1
Facility: ETF Treatment Technology Ion Exchange
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 0	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 0	
1.3.2 Safety Assurance Documentation	\$ 0	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 275
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 0	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 0	
2.7 Contingency	\$ 0	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 30	
3.2 Annual Utilities	\$ 1	
3.3 Annual Materials	\$ 18	
3.4 Annual Maintenance	\$ 11	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 60	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 15
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 0	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 0
SUB COST FOR ION EXCHANGE MODULE		\$ 290
ESCALATION		1.06
TOTAL COST		\$ 307

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead

Option Number: SR-W041A-2

Facility: Vendor/Onsite

Treatment Technology Stabilization

Treatment Cycle Flow Diagram:

Pros

- Little secondary waste generated.
- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- The waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- Proven process, used both in DOE-complex and the commercial world.
- Similar systems in the commercial nuclear industry experience availability of 80%.
- Requires fewer non-operational workers than comparably sized facilities. Experience in similar facilities indicates that little non-routine maintenance is needed.
- Well accepted waste form. Similar processes result in wasteforms that meet stability requirements for radionuclides for class A stable waste.
- All wastes are LLW because will meet treatment standard.
- Process will be in compliance without requiring a variance.

Cons

- The waste volume will more than double.
- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because the waste volume will more than double.
• secondary waste generation	80	Little secondary waste generated.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form can be easily shipped as-is. Similar processes result in wasteforms that meet stability requirements for radionuclides for class A stable waste.

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead

Option Number: SR-W041A-2

Facility: Vendor/Onsite

Treatment Technology Stabilization

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• final waste form	100	The waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because proven process, used both in DOE-complex and the commercial world.
• availability	80	Similar systems in the commercial nuclear industry experience availability of 80%.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form can be ground up and reprocessed.
• schedule for treatment of waste	70	This is a mature technology. Subtract 10 points from the median score of 80 because the process is neither skid-mounted nor currently available in the U. S.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	80	Requires fewer non-operational workers than comparably sized facilities. Experience in similar facilities indicates that little non-routine maintenance is needed.
• operational worker potential exposure	50	Facility requires about the same number of operational workers as comparably sized, skid mounted facilities.
• transportation potential exposure	50	Additional characterization needed. Waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be in compliance without requiring a variance.
• ability to obtain a permit	50	Must demonstrate that waste meets treatment standards.
• waste disposal	80	All wastes are LLW.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 59 Total 73

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W031-4

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead

Option Number: SR-W041A-3

Facility: Vendor/Onsite

Treatment Technology Polymer
Encapsulation

Treatment Cycle Flow Diagram:

Pros

- Little secondary waste generated.
- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form meets shipping requirements in the form it exits the treatment process
- The waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- This is a proven process, used both in DOE-complex and the commercial world.
- Mature technology. Vendor will bring onsite and set up with a minimum delay.
- Process can be installed in a building with adequate emission controls.
- Skid mounted, no D&D, vendor removes upon completion of work. Facility requires more non-operational workers than other comparably sized, skid mounted facilities.
- Full compliance without requiring a variance.
- Waste can be disposed as LLW.

Cons

- The waste volume will more than double.
- Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because the waste volume will more than double.
• secondary waste generation	80	Little secondary waste generated.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead

Option Number: SR-W041A-3

Facility: Vendor/Onsite

In-Depth Options Analysis Score Sheet

Treatment Technology Polymer
Encapsulation

Attribute	Score	Discussion/Notes
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process
• final waste form	100	The waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	This is a proven process used in the DOE-complex. Add 20 points to the median score of 80 because it is used in the commercial world.
• availability	60	Add 10 points to the median score of 50 because although operator error can cause downtime, system is normally available 50% of the time.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form can be ground up and reprocessed.
• schedule for treatment of waste	80	Mature technology. Vendor will bring onsite and set up with a minimum delay.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	70	Requires the same number of non-operational workers as comparable skid-mounted units. Most or all initial construction can be done in a vendor shop. Experience in similar facilities indicates that little non-routine maintenance is required. Subtract 10 points from median score of 80 because of uncertainties surrounding D&D efforts.
• operational worker potential exposure	40	Subtract 10 points from the median score of 50 because the facility requires more operational workers than other comparably sized, skid mounted facilities.
• transportation potential exposure	60	There is a no additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Full compliance without requiring variance.
• ability to obtain a permit	80	Must demonstrate that waste meets treatment standards.
• waste disposal	80	Waste can be disposed as LLW.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	20	Not a budgeted item, will require line item funding.

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead
Option Number: SR-W041A-3
Facility: Vendor/Onsite Treatment Technology Polymer
In-Depth Options Analysis Score Sheet Encapsulation

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an exist'ng vendor process.

IDOA Score: Technical 59 Total 73

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W031-2

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead

Option Number: SR-W041A-4

Facility: Containment Building

Treatment Technology In-Drum Stab.

Treatment Cycle Flow Diagram:

Pros

- The entire process takes place inside the final disposal container. No secondary waste generated.
- No additional treatment is required to meet LDR.
- Waste form meets shipping requirements in the form it exits the treatment process.
- Waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- Proven process, use both DOE & commercial world.
- Process will be in full compliance with regulations without a variance.
- Disposal will be as non-hazard radioactive waste. Meets treatment standards.

Cons

- Waste is divided among containers and encapsulating material added, which will increase the amount of waste material going to storage.
- Waste form is not as permanent as other forms of stabilization.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Waste is divided among containers and encapsulating material added, which will increase the amount of waste material going to storage.
• secondary waste generation	100	The entire process takes place inside the final disposal container. Add 20 points to the median score of 80 because no secondary waste generated.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	50	Provided the material is compatible with cement stabilization, and is of such a size as to fit in the stabilization container, this process can handle it.

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead
Option Number: SR-W041A-4
Facility: Containment Building Treatment Technology In-Drum Stab.
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.
• final waste form	100	Waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	80	Proven process, use both DOE & commercial world.
• availability	50	System is normally available 50% of the time.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failure of the encapsulating material to set-up would necessitate grinding up and reprocessing. The technology is well-established.
• schedule for treatment of waste	40	Ancillary containment building process will have to be designed. Subtract 10 points from the median score of 50 because installation in a containment building will add uncertainties.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	40	Subtract 10 points from the median score of 50 because maintenance of encapsulating material mixing equipment will require an average crew. Personal protective equipment needed for work in a containment building.
• operational worker potential exposure	60	An average crew is required to operate the equipment. Add 10 points to the median score of 50 because small quantity of waste to be treated.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be in full compliance with regulations without a variance.
• ability to obtain a permit	50	Proven process that has been permitted elsewhere.
• waste disposal	80	Disposal will be as LLW.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	96	
• funding availability	50	Not a budgeted item. May be covered by operating funds, but an increase in budget will be required.

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead
Option Number: SR-W041A-4
Facility: Containment Building Treatment Technology In-Drum Stab.
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	20	Process is commercially available.
• private sector involvement	80	More than one qualified vendor has been identified who can treat this waste.

IDOA Score: Technical 54 Total 67

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead
Option Number: SR-W041A-4
Facility: Containment Building **Treatment Technology** In-Drum Stab.
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 11	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 45	
1.3.2 Safety Assurance Documentation	\$ 11	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 8	
TOTAL PRE-OPERATIONS		\$ 351
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 50	
2.2 Inspection	\$ 14	
2.3 Project Management	\$ 22	
2.4 Building Construction (inc. indirect)	\$ 175	
2.5 Equipment (inc. indirect)	\$ 50	
2.6 Construction Management	\$ 16	
2.7 Contingency	\$ 117	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 444
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 30	
3.2 Annual Utilities	\$ 1	
3.3 Annual Materials	\$ 18	
3.4 Annual Maintenance	\$ 11	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 60	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 15
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 180	
4.2 Closure, Post-Closure, Monitoring	\$ 1	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 181
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 25
SUB COST FOR IN-DRUM STABILIZATION MODULE		\$ 1016
ESCALATION		1.23
TOTAL COST		\$ 1249

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead

Option Number: SR-W041A-5

Facility: Vendor

Treatment Technology Precipitation

Treatment Cycle Flow Diagram:

Pros

- No additional treatment is required to meet LDR.
- Waste form meets shipping requirements in the form it exits the treatment process.
- Process can be installed in a building with adequate emission controls.
- Process will be designed to comply with applicable regulations without seeking a variance.
- Waste can be disposed as LLW.

Cons

- Common technology. Scale-up problems could cause uncertainties in the schedule.
- Process without directly applicable operating history to demonstrate environmental acceptability will concern the public.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because the volumes of secondary waste. Volume is >1:1.
• secondary waste generation	40	Subtract 10 points from the median score of 50 because aqueous technology generates secondary waste streams that require treatment.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	50	Designed to precipitate heavy metal from wastewater. Could be used to treat acid effluent from heavy metal dissolving. Would require further bench and pilot scale testing.
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.
• final waste form	50	Meets the expected WAC for disposal. Additional secondary waste treatment is required. Waste form is disposable in the form in which it exits the process.

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Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead
Option Number: SR-W041A-5
Facility: Vendor
In-Depth Options Analysis Score Sheet

Treatment Technology Precipitation

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	50	Common process. May require further process development to handle site specific waste streams.
• availability	50	Availability expected to equal that of other precipitation process. Cleaning the multi-media filters will reduce availability.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form would require additional macroencapsulation.
• schedule for treatment of waste	20	Common technology. Scale-up problems could cause uncertainties in the schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	50	Expect process would require a number of non-operational works similar to a wastewater treatment plant.
• operational worker potential exposure	50	Expect process would require a number of operational works similar to a wastewater treatment plant.
• transportation potential exposure	50	Some additional characterization needed.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be designed to comply with applicable regulations without seeking a variance.
• ability to obtain a permit	50	Must demonstrate that waste meets treatment standards. Lack of operating background from other facilities may engender concerns.
• waste disposal	80	Waste can be disposed as LLW.
<i>Public Acceptance</i>		
• public acceptance	20	Process without directly applicable operating history to demonstrate environmental acceptability will concern the public.
<i>Cost Considerations</i>		
• life cycle cost	87	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is a vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is a vendor process.

IDOA Score: Technical 45 Total 57

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead

Option Number: SR-W041A-5

Facility: Vendor

Treatment Technology Precipitation

Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 60	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 239	
1.3.2 Safety Assurance Documentation	\$ 60	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 678
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 220	
2.2 Inspection	\$ 70	
2.3 Project Management	\$ 115	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 250	
2.6 Construction Management	\$ 70	
2.7 Contingency	\$ 620	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2345
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 150	
3.2 Annual Utilities	\$ 6	
3.3 Annual Materials	\$ 90	
3.4 Annual Maintenance	\$ 54	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 300	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 75
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 1000	
4.2 Closure, Post-Closure, Monitoring	\$ 5	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1005
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 100
SUB COST FOR PRECIPITATION MODULE		\$ 4203
ESCALATION		1.092
TOTAL COST		\$ 4590

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead

Option Number: SR-W041A-6

Facility: INEL/WEDF

Treatment Technology Stabilization

Treatment Technology

The INEL WEDF Stabilization process provides treatments for aqueous and organic liquids and debris. The process stabilizes waste in a grout matrix to reduce leachability.

Pros

- No secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a RCRA facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	No secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead

Option Number: SR-W041A-6

Facility: INEL/WEDF

Treatment Technology Stabilization

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the state's acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	50	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 65

Waste Stream Number & Name: SR-W041A Aqueous Mercury and Lead
Option Number: SR-W041A-6
Facility: INEL/WEDF
Cost Estimate Sheet

Treatment Technology Stabilization

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 100	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ 100
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 1
7.0 Transportation		\$ 156
8.0 Disposal		\$ 100
SUB COST FOR STABILIZATION MODULE		\$ 356
ESCALATION		1.06
TOTAL COST		\$ 377

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W041B Aqueous Mercury and Lead (Elemental Liquid Mercury)

Background Information

In the MWIR, SR-W041 is reported as a single waste stream, due to the fact that it is all in one drum. However, upon evaluation, it was recognized that the stream should be divided into its three distinct compounds. Thus, the stream numbers have been changed with the addition of an A, B, or C suffix. This portion of the waste stream is two 0.5 liter bottles of elemental mercury. This waste was generated by SRTC operations in support of the Naval Fuels Developmental Facility (779-A) which is now closed.

Volume

- Current volume through 09/30/93 is 0.01 m³.
- No future waste generation expected because waste generated from cleanout of laboratory which is no longer operational.

Waste Stream Composition

- Elemental Mercury

Waste Code

- D009D (elemental Hg)

LDR Treatment Standard

- Specified technology is amalgamation.

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based on the waste composition.

Radiological Characterization

- Tritium, alpha emitter is U²³⁸, and beta/gamma emitter.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Combustion	Incineration is not an appropriate treatment for elemental mercury.
CIF	Ashcrete	Concrete stabilization is not an appropriate treatment for elemental mercury.
ETF	Wastewater	ETF has no process to treat this waste.
Z-Area	Stabilization	Concrete stabilization is not an appropriate treatment for elemental mercury.
LETF	Wastewater	LETF has no equipment to treat this waste.
M-Area	Vitrification	Vitrification is not an appropriate treatment for elemental mercury.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W041B Aqueous Mercury and Lead (Elemental Liquid Mercury)

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W041B-1	INEL/WEDF	Amalgamation	*	51	65	228	√
SR-W041B-2	Cont. Bldg.	Distill/Reuse	51	51	62	7341	
SR-W041B-3	Cont. Bldg.	Distill/Amalg	51	46	56	8139	
SR-W041B-4	HW/MW-TB	Distill/Amalg	51	33	40	17810	

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

- No options were rejected.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Elemental Mercury portion of the Aqueous Mercury and Lead waste stream is Amalgamation at an offsite DOE facility; the Idaho National Engineering Laboratory/Waste Engineering Development Facility (INEL/WEDF) – Amalgamation Unit.

This option treats the constituent of concern mercury by binding it with another metal into a non-leachable form (amalgam).

This option is preferred because:

- No secondary waste streams are generated.
- This waste stream is similar to the design basis for the facility.
- Treatment is BDAT.
- Offsite treatment is cost effective.

Options Rejected During IDOA

Distillation Followed by Reuse or Amalgamation in a Containment Building or HW/MW-TB

Distillation followed by reuse or amalgamation in a containment building or HW/MW-TB was rejected because:

- Preferred option is BDAT.
- Rejected options are far less cost effective than the preferred option.
- Rejected options require design and construction of new facilities.
- New facilities will be decommissioned, and relegated to waste after only a short operating period.

Waste Stream Number & Name: SR-W041B Elemental Liquid Mercury
Option Number: SR-W041B-1
Facility: INEL/WEDF Treatment Technology Amalgamation

Treatment Technology

This process is amalgamation, which can be used for radioactive wastes containing mercury and particularly to wastes containing radioactive mercury isotopes. Mercury and the amalgamating material combine to form a material (amalgam) in which the mercury is easily managed and immobile.

Pros

- No secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	No secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.

Waste Stream Number & Name: SR-W041B Elemental Liquid Mercury
Option Number: SR-W041B-1
Facility: INEL/WEDF Treatment Technology Amalgamation
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the state's acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	20	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget more than 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 65

Waste Stream Number & Name: SR-W041B Elemental Liquid Mercury
Option Number: SR-W041B-1
Facility: INEL/WEDF
Treatment Technology Amalgamation
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 98
7.0 Transportation		\$ 17.6
8.0 Disposal		\$ 100
SUB COST FOR AMALGAMATION MODULE		\$ 215
ESCALATION		1.06
TOTAL COST		\$ 228

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W041B Aqueous Mercury and Lead (Elemental Liquid Mercury)
Option Number: SR-W041B-2
Facility: Containment Building Treatment Technology Distill/Reuse

Treatment Cycle Flow Diagram:

Pros

- Significant reduction in waste volume as Hg is recovered for reuse.
- A variety of secondary wastes, but small scale equipment.
- Materials will be reused.
- Final waste form will meet WAC.
- Small scale process. Availability will be of little concern.
- Potential for tritium release is small. Process will take place in a controlled area. Source is small.
- Process will comply with regulations without requiring a variance.
- Process is well-defined, and has been permitted in other locations, tritium in the Hg.

Cons

- Fixed by design. Increased throughput possible by adding operating shifts.
- Traps and used equipment will require disposal in HW/MW.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	80	Significant reduction in waste volume as Hg is recovered for reuse.
• secondary waste generation	80	A variety of secondary wastes, but small scale equipment.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because materials will be reused.
• flexibility	50	Process may require additional steps or equipment to handle off-design input streams.
• ability to be shipped	50	There are no treatment residuals because material will be for reuse. Contaminated processing equipment will require simple treatment prior to shipment.
• final waste form	80	Final waste form will meet WAC.

Waste Stream Number & Name: SR-W041B Aqueous Mercury and Lead (Elemental Liquid Mercury)
Option Number: SR-W041B-2
Facility: Containment Building Treatment Technology Distill/Reuse
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	70	The process is commercially available. Subtract 10 points from the median score of 80 because there are uncertainties arising from operation in a tritium environment.
• availability	80	Small scale process. Availability will be of little concern.
• scalability	20	Fixed by design. Increased throughput possible by adding operating shifts.
• remedial measures	50	Rupture or breakage of glass equipment will require a significant clean-up effort.
• schedule for treatment of waste	50	Some technology concerns about operating in a tritium environment.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Potential for tritium release is small. Process will take place in a controlled area. Source is small.
• non-operational worker potential exposure	40	Subtract 10 points from the median score of 50 because the process equipment is small but decommissioning costs would be high for a waste stream of such small volume of waste.
• operational worker potential exposure	50	An average number of operational workers will be required to tend this process.
• transportation potential exposure	50	Waste will require some additional characterization before transportation to storage.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will comply with regulations without requiring a variance.
• ability to obtain a permit	70	The process is well-defined. Subtract 10 points from the median score of 80 because the process has been permitted in other locations, tritium in the Hg.
• waste disposal	20	Traps and used equipment will require disposal in HW/MW.
<i>Public Acceptance</i>		
• public acceptance	20	Public concern may be allayed because Hg is recycled for reuse.
<i>Cost Considerations</i>		
• life cycle cost	79	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	20	Adaptation of existing technology.
• private sector involvement	50	Other vendors have expressed an interest in treating this waste stream.

IDOA Score: Technical 51 Total 62

Waste Stream Number & Name: SR-W041B Aqueous Mercury and Lead (Elemental Liquid Mercury)
Option Number: SR-W041B-2
Facility: Containment Building Treatment Technology Distill/Reuse
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 84	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 335	
1.3.2 Safety Assurance Documentation	\$ 84	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 822
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 374	
2.2 Inspection	\$ 98	
2.3 Project Management	\$ 143	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 700	
2.6 Construction Management	\$ 119	
2.7 Contingency	\$ 868	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 3302
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 75	
3.2 Annual Utilities	\$ 3	
3.3 Annual Materials	\$ 45	
3.4 Annual Maintenance	\$ 27	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 150	
X NUMBER OF YEARS OF OPERATION	2.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 300
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 1360	
4.2 Closure, Post-Closure, Monitoring	\$ 1	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1361
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 10
SUB COST FOR DISTILL AND REUSE MODULE		\$ 5794
ESCALATION		1.267
TOTAL COST		\$ 7341

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W041B Aqueous Mercury and Lead (Elemental Liquid Mercury)
Option Number: SR-W041B-3
Facility: Containment Building Treatment Technology Distill/Amalg

Treatment Cycle Flow Diagram:

Pros

- LDR will be met without further treatment.
- All treatment residuals will be able to be shipped without further treatment.
- Final waste form will meet WAC.
- Small scale process. Availability will be of little concern.
- Process will take place in a controlled laboratory area. Source is small.
- Process will comply with regulations without requiring a variance.
- The process is well-defined, and has been permitted in other locations.

Cons

- Waste volume increases by a factor of 2 because of the amalgam.
- Fixed by design. Increased throughput possible by adding operating shifts.
- Owing to the small batch size, it is expected that this will be a labor intensive process.
- All waste will require disposal in HW/MW.
- Process does not create a waste form that is as permanent as others.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because waste volume increases by a factor of 2 because of the amalgam.
• secondary waste generation	40	Subtract 10 points from the median score of 50 because contaminated process equipment created.
• destruction removal and demobilization efficiency	80	LDR will be met without further treatment.
• flexibility	50	Process may require additional steps or equipment to handle off-design input.
• ability to be shipped	80	All treatment residuals will be able to be shipped without further treatment.
• final waste form	80	Final waste form will meet WAC.

Waste Stream Number & Name: SR-W041B Aqueous Mercury and Lead (Elemental Liquid Mercury)
Option Number: SR-W041B-3
Facility: Containment Building Treatment Technology Distill/Amalg
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	80	The process is commercially available.
• availability	80	Small scale process. Availability will be of little concern.
• scalability	20	Fixed by design. Increased throughput possible by adding operating shifts.
• remedial measures	50	Failure to amalgamate can be addressed by reprocessing with more reagents.
• schedule for treatment of waste	50	Some technology concerns.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process will take place in a controlled laboratory area. Source is small.
• non-operational worker potential exposure	40	The process equipment is small. Subtract 10 points from the median score of 50 because decommissioning may be labor-intensive.
• operational worker potential exposure	20	Owing to the small batch size, it is expected that this will be a labor intensive process.
• transportation potential exposure	50	Waste will require some additional characterization before transportation to storage.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will comply with regulations without requiring a variance.
• ability to obtain a permit	70	The process is well-defined. Subtract 10 points from the median score of 80 because the process has been permitted in other locations.
• waste disposal	20	All waste will require disposal in HW/MW.
<i>Public Acceptance</i>		
• public acceptance	20	Process does not create a waste form that is as permanent as others.
<i>Cost Considerations</i>		
• life cycle cost	77	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	20	Adaptation of existing technology.
• private sector involvement	50	Other vendors have expressed an interest in treating this waste stream.

IDOA Score: Technical 46 Total 56

Waste Stream Number & Name: SR-W041B Aqueous Mercury and Lead (Elemental Liquid Mercury)
Option Number: SR-W041B-3
Facility: Containment Building Treatment Technology Distill/Amalg
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 93	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 372	
1.3.2 Safety Assurance Documentation	\$ 93	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 752
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 418	
2.2 Inspection	\$ 106	
2.3 Project Management	\$ 151	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 900	
2.6 Construction Management	\$ 133	
2.7 Contingency	\$ 964	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 3672
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 750	
3.2 Annual Utilities	\$ 30	
3.3 Annual Materials	\$ 450	
3.4 Annual Maintenance	\$ 270	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 1500	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 375
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 1520	
4.2 Closure, Post-Closure, Monitoring	\$ 5	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1525
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 100
SUB COST FOR DISTILL AND AMALG MODULE		\$ 6424
ESCALATION		1.267
TOTAL COST		\$ 8139

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W041B Aqueous Mercury and Lead (Elemental Liquid Mercury)
Option Number: SR-W041B-4
Facility: HW/MW-TB Treatment Technology Distill/Amalg

Treatment Cycle Flow Diagram:

Pros

- LDR will be met without further treatment.
- All treatment residuals will be able to be shipped without further treatment.
- Final waste form will meet WAC.
- Small scale process, availability is of little concern.
- Process will take place in a controlled area. Source is small.
- Process will comply with regulations without requiring a variance.

Cons

- Waste volume increases by a factor of 2 because of the amalgam.
- Fixed by design. Need for increased throughput is not expected.
- Implementation of HW/MW facility cannot be predicted with any degree of certainty.
- New facility will require a RCRA Part B Permit Application.
- All waste will require disposal in a HW/MW facility.
- Process does not create an irreversibly stable waste form, although it is the BDAT.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
Process Parameters		
• volume alteration	10	Subtract 10 points from the median score of 20 because waste volume increases by a factor of 2 because of the amalgam.
• secondary waste generation	40	Subtract 10 points from the median score of 50 because contaminated process equipment created.
• destruction removal and demobilization efficiency	80	LDR will be met without further treatment.
• flexibility	50	Process may require additional steps to handle off-design input.
• ability to be shipped	80	All treatment residuals will be able to be shipped without further treatment.
• final waste form	80	Final waste form will meet WAC.

Waste Stream Number & Name: SR-W041B Aqueous Mercury and Lead (Elemental Liquid Mercury)
Option Number: SR-W041B-4
Facility: HW/MW-TB Treatment Technology Distill/Amalg
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	80	Process is commercially available.
• availability	80	Small scale process, availability is of little concern.
• scalability	20	Fixed by design. Need for increased throughput is not expected.
• remedial measures	50	Failure to amalgamate can be addressed by reprocessing with other reagents.
• schedule for treatment of waste	30	Subtract 20 points from a median score of 50 because implementation of HW/MW facility cannot be predicted with any degree of certainty.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process will take place in a controlled area. Source is small.
• non-operational worker potential exposure	40	Subtract 10 points from the median score of 50 because despite the small size of the process, decommissioning may be labor-intensive.
• operational worker potential exposure	20	Owing to its small size, the process is expected to be labor-intensive.
• transportation potential exposure	50	Waste will require some additional characterization before transportation to storage.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will comply with regulations without requiring a variance.
• ability to obtain a permit	20	New facility will require a RCRA Part B Permit Application.
• waste disposal	20	All waste will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	20	Process does not create an irreversibly stable waste form, although it is the BDAT.
<i>Cost Considerations</i>		
• life cycle cost	49	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	20	Adaptation of existing technology.
• private sector involvement	50	Other vendors have expressed an interest in treating this stream.

IDOA Score: Technical 33 Total 40

Waste Stream Number & Name: SR-W041B Aqueous Mercury and Lead (Elemental Liquid Mercury)
Option Number: SR-W041B-4
Facility: HW/MW-TB Treatment Technology Distill/Amalg
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 196	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 782	
1.3.2 Safety Assurance Documentation	\$ 196	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 135	
TOTAL PRE-OPERATIONS		\$ 1583
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 858	
2.2 Inspection	\$ 246	
2.3 Project Management	\$ 381	
2.4 Building Construction (inc. indirect)	\$ 3000	
2.5 Equipment (inc. indirect)	\$ 900	
2.6 Construction Management	\$ 273	
2.7 Contingency	\$ 2028	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 7686
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 750	
3.2 Annual Utilities	\$ 30	
3.3 Annual Materials	\$ 450	
3.4 Annual Maintenance	\$ 270	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 1500	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 375
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 3120	
4.2 Closure, Post-Closure, Monitoring	\$ 5	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 3125
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 100
SUB COST FOR AMALGAMATION MODULE		\$ 12869
ESCALATION		1.384
TOTAL COST		\$ 17810

If above numbers do not appear to add correctly, it is the result of computer rounding.

Summary Page – Initial Screening

Waste Stream Number & Name: SR-W041C Aqueous Mercury and Lead (Mercury Contaminated Recorder)

Background Information

In the MWIR, SR-W041 is reported as a single waste stream, due to the fact that it is all in one drum. However, when evaluating the waste stream, it was recognized that the stream should be divided into its three distinct components. Thus, the stream numbers have been changed with the addition of an A, B, or C suffix. This portion of the waste stream is a mercury contaminated recorder (equipment) from analytical support of the Naval Fuels Development Facility in SRTC. The Naval Fuels Development Facility has been closed.

Volume

- Current volume through 09/30/93 is 0.1 m³.
- No future waste generation expected because waste generated from cleanout of laboratory which is no longer operational.

Waste Stream Composition

- Inorganic Debris (mercury recorder)

Waste Code

- D009A (TCLP Hg) Nonwastewater

LDR Treatment Standard

- D009A = concentration based standard – 0.2 mg/l
- Alternative debris technology may be applied.

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based on knowing process history of the recorder.

Radiological Characterization

- Tritium, alpha emitter is U²³⁸, and Beta/Gamma emitter.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Combustion	CIF has no equipment to control Hg vapors and CIF is not a Roast and Retort facility.
CIF	Ashcrete	Ashcrete will not immobilize the constituents of concern to pass TCLP.
ETF	Wastewater	ETF has no process to treat this waste.
Z-Area	Stabilization	Any waste stream outside of low level salt solution must be treated to comply with waste acceptance criteria and be place in Tank 50.
LETF	Wastewater	LETF has no equipment to treat this waste.
M-Area	Vitrification	Vitrifier has no provision to control volatilized Hg and metal debris is inappropriate for this process.
Cont. Bldg.	Roast & Retort	Minuscule waste stream. Not efficient to construct a facility for it alone. It cannot be combined with similar option at tritium because waste may contain fissile material, which cannot be introduced to tritium facility.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W041C Aqueous Mercury and Lead (Mercury Contaminated Recorder)

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF	IDOA Scores		COST (x 1000)	PO
			Score	Tech.	Total		
SR-W041C-1	Cont. Bldg.	S. S. Box	88	58	72	SR-W015-1	√
SR-W041C-2	HW/MW-TB	S. S. Box	100	58	72	SR-W015-2	

Options Rejected Due To Low Technology Success Factor

- No options were rejected.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Mercury Contaminated Recorder waste stream is Macroencapsulation and requesting regulatory discretion in treating with SR-W015 as a 90-day generator.

This option treats the constituent of concern, mercury, by isolating it from the environment in a stainless steel box that has been welded shut.

This option is preferred because:

- LDR standards are met.
- Process is proven (i.e., welding stainless steel).
- Combining this waste with waste SR-W015 is cost effective, but requires SCDHEC approval to remove from storage and treat in the tritium's 90-day generator facility.

Options Rejected During IDOA

Macroencapsulation in a Stainless Steel Box in a HW/MW-TB

Macroencapsulation in a Stainless Steel Box in a HW/MW-TB was rejected because:

- Rejected option is less cost effective than the preferred option, without offering any environmental, or technological, advantage.

Waste Stream Number & Name: SR-W041C Aqueous Mercury and Lead (Mercury Contaminated Recorder)
Option Number: SR-W041C-1
Facility: Containment Building Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- Process satisfies requirements of the "debris rule" and all applicable LDR standards are met.
- Can process a wide range of materials without loss of efficiency due to off design input.
- S. S. containers will meet current DOT shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- All processes involved are existing technology.
- Similar systems have demonstrated availability of >80%.
- The process failure does not produce altered waste form. A failed container is easily fixed.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.
- Simple welding process requiring minimal maintenance. Minimal personnel required for decommissioning.
- Exposure controlled by design and < average number of workers. Low potential for exposure.

Cons

- All waste will require disposal in HW/MW facilities.
- Not a budget item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
Process Parameters		
• volume alteration	40	Subtract 10 points from the median score of 50 because the volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met
• flexibility	80	Can process a wide range of materials without loss of efficiency due to off design input.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.
Engineering Parameters		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved are existing technology.
• availability	80	Similar systems have demonstrated availability of >80%.

Waste Stream Number & Name: SR-W041C Aqueous Mercury and Lead (Mercury Contaminated Recorder)
Option Number: SR-W041C-1
Facility: Containment Building Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• scalability	50	Throughput is set by design and not easily expanded except by adding additional shifts of operation.
• remedial measures	90	The process failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container is easily fixed.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	80	Simple welding process requiring minimal maintenance. Minimal personnel required for decommissioning.
• operational worker potential exposure	80	Exposure controlled by design and < average number of workers. Low potential for exposure.
• transportation potential exposure	60	Add 10 points to the median score of 50 because no additional characterization needed. Waste can be handled readily following treatment.
<i>Regulatory Parameters</i>		
• need for variance	80	Process satisfies requirements of the "debris rule."
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	20	All waste will require disposal in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the waste form is not as permanent as vitrification.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	20	Not a budget item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	No private sector involvement is anticipated. Subtract 20 points from the median score of 20 because this is an existing technology.

IDOA Score: Technical 58 Total 72

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W015-1

Waste Stream Number & Name: SR-W041C Aqueous Mercury and Lead (Mercury Contaminated Recorder)
Option Number: SR-W041C-2
Facility: HW/MW-TB Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- All applicable LDR standards are met.
- Can process a wide range of materials.
- S. S. containers will meet current DOT shipping requirements.
- Final waste form will meet RCRA Subtitle C Disposal WAC.
- All processes involved are existing technology.
- Similar systems have demonstrated availability of >80%.
- Process failure does not produce altered waste form. A failed container is easily fixed.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.
- Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
- Exposure controlled by design. Number of workers is dependent upon throughput.
- Process satisfies requirements of the "debris rule."

Cons

- All waste will require disposal in HW/MW facilities.
- Not a budget item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met.
• flexibility	80	Can process a wide range of materials.
• ability to be shipped	80	S. S. containers will meet current DOT shipping requirements.
• final waste form	80	Final waste form will meet RCRA Subtitle C Disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved are existing technology.

Waste Stream Number & Name: SR-W041C Aqueous Mercury and Lead (Mercury
Option Number: SR-W041C-2 Contaminated Recorder)
Facility: HW/MW-TB Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• availability	80	Similar systems have demonstrated availability of >80%.
• scalability	50	Throughput is set by design and not easily expanded except by adding additional shifts of operation.
• remedial measures	90	Process failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container is easily fixed.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	80	Simple welding process requiring minimal maintenance. No additional requirements for decommissioning.
• operational worker potential exposure	80	Exposure controlled by design. Number of workers is dependent upon throughput.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process satisfies requirements of the "debris rule."
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	20	All waste will require disposal in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the waste form is not as permanent as vitrification.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	20	Not a budget item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because this is an existing technology.

IDOA Score: Technical 58 Total 72

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W015-2

Summary Page – Initial Screening

Waste Stream Number & Name: SR-W042 Paints and Thinners

Background Information

This waste stream consists of radiologically contaminated, offspecification waste paint, spent paint solvents, and paint chips from paint removal activities.

Volume

- Current volume through 09/30/93 is 5.3 m³.
- Expected 1993-1997 volume will be 5.0 m³.

Waste Stream Composition

- Organic Sludge/Particulate

Waste Code

- D001A (ignitable high TOC), D005A (TCLP Ba), D006A (TCLP Cd), D007A (TCLP Cr), D008A (TCLP Pb), D009A (TCLP Hg), D011A (TCLP Ag), D018 (benzene), D035 (methylethylketone), D038 (pyridine), F003 (xylene, acetone), F005A (nonhalogenated spent solvents)

LDR Treatment Standard

- D001A specified technology = Fuel Substitution, Recovery of Organics, or Incineration
- D005-D009, D011, F003, F005A concentration based standards = 0.2 mg/l-170 mg/kg except F005A 2-Ethoxyethanol, 2-Nitropropane = Incineration
- D018, D035, D038 = no treatment standard yet developed by EPA

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high because sample and analysis available.

Radiological Characterization

- Total activity is 0.45 nCi/g.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Rationale for Rejection
CIF	Ashcrete	Ashcrete does not remove the characteristic organics. Resulting waste form would not meet LDR requirements.
ETF	Wastewater	ETF has no process to treat solvents.
LETF	Wastewater	Wastewater treatment is not designed to treat a solvent stream.
M-Area	Vitrification	Vitrifier is not an incinerator. It is not designed to burn an organic stream.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W042 Paints and Thinners

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W042-1	CIF	Incineration	94	63	76	4134	√
SR-W042-2	INEL/WEDF	Stabilization	*	51	65	243	
SR-W042-3	INEL/WERF	Incineration	*	45	59	601	

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

- No options were rejected.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Paints and Thinners waste stream is Incineration in the Consolidated Incineration Facility.

This option treats the constituents of concern, listed wastes and the hazardous characteristic, ignitability, by conversion of the combustible fraction to carbon dioxide and water, and stabilizing ash with cement.

This option is preferred because:

- Waste volume will be reduced by a factor of at least 2.
- Final waste form will meet LDR standards.
- Incineration and ash stabilization are demonstrated technologies.
- CIF is currently under construction.
- Residual solids are stabilized with cement.
- It is a cost-effective option.
- No treatability studies will be needed.

Options Rejected During IDOA

Stabilization at INEL/WEDF

Stabilization at INEL/WEDF (encapsulating the waste with a grout matrix) was rejected because:

- Stabilization is not the specified technology for this waste stream.

Incineration at INEL/WERF

Incineration at INEL/WERF was rejected because:

- Cost of pretreatment (shredding and packaging) will not be avoided
- Offsite incineration offers neither technological nor environmental advantage over the preferred option.
- Apparent cost advantage over the preferred option is a consequence of the accounting methods stipulated, which do not consider overhead and capital costs of offsite facilities.

Waste Stream Number & Name: SR-W042 Paints and Thinners
Option Number: SR-W042-1
Facility: CIF Treatment Technology: Incineration

Treatment Cycle Flow Diagram:

Pros

- Expect at least 40:1 reduction.
- Low ash content due to decanting the sludge results in small quantity of secondary waste being generated.
- The waste stream is expected to meet all applicable LDR standards after treatment with this process.
- Incinerator designed for a wide range of wastes with some operational limitations.
- Waste form meets the shipping requirements without additional treatment.
- The final waste form meets expected WAC for disposal in the form it exits the facility.
- Incineration is a current demonstrated technology.
- Incinerator availability for liquids is 70%. Normal maintenance requirements apply.
- Very little potential for waste stream to require rework; process failure does not create a waste that can not be treated by this similar facility.
- Reasonably easy to schedule this waste stream assuming current startup schedule.
- Little increase to the environment or public health is expected from this waste stream because there are little facility emissions even in most accidents.
- There is no increase in the number of non-operational workers, but there will be additional non routine maintenance.
- No impact because there is no additional operational workers required and no increase in exposure potential.
- Process is in full compliance with existing regulations and no variance is required to treat this waste.
- Line item is funded.

Waste Stream Number & Name: SR-W042 Paints and Thinners

Option Number: SR-W042-1

Facility: CIF

Treatment Technology Incineration

Cons

- 100% of the final waste form will go to the HW/MW Vaults.
- Incineration is the BDAT for this waste stream. Public has expressed disapproval of incineration and questioned the safety of incineration.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	90	Add 10 points to the median score of 80 because expect at least 40:1 reduction.
• secondary waste generation	80	Low ash content due to decanting the sludge results in small quantity of secondary waste being generated.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because the waste stream is expected to meet all applicable LDR standards after treatment with this process.
• flexibility	80	Incinerator designed for a wide range of wastes with some operational limitations.
• ability to be shipped	80	Waste form meets the shipping requirements without additional treatment.
• final waste form	100	Add 20 points to the median score of 80 because the final waste form meets expected WAC for disposal in the form it exits the facility.
<i>Engineering Parameters</i>		
• system implementability	80	Incineration is a current demonstrated technology.
• availability	70	Incinerator availability for liquids is 70%. Normal maintenance requirements apply. Subtract 10 points from the median score of 80 because this waste stream may require a "clean-out" earlier than anticipated based on curie load.
• scalability	50	Process capacity is set by design and it will accept a wide range of inputs. Excess capacity does exist at this time.
• remedial measures	80	Very little potential for waste stream to require rework; process failure does not create a waste that can not be treated by this similar facility.
• schedule for treatment of waste	80	Reasonably easy to schedule this waste steam assuming current startup schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Little increase to the environment or public health is expected from this waste stream because there are little facility emissions even in most accidents.
• non-operational worker potential exposure	80	There is no increase in the number of non-operational workers, but there will be additional non routine maintenance.
• operational worker potential exposure	80	No impact because there is no additional operational workers required and no increase in exposure potential.
• transportation potential exposure	60	Add 10 points to the median score of 50 because limited amount for transportation.
<i>Regulatory Parameters</i>		
• need for variance	80	Process is in full compliance with existing regulations and no variance is required to treat this waste.

Waste Stream Number & Name: SR-W042 Paints and Thinners
Option Number: SR-W042-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• ability to obtain a permit	100	Add 20 points to the median score of 80 because this waste is part of the basis for permitting.
• waste disposal	20	100% of the final waste form will go to the HW/MW Vaults.
<i>Public Acceptance</i>		
• public acceptance	20	Incineration is the BDAT for this waste stream. Public has expressed disapproval of incineration and questioned the safety of incineration.
<i>Cost Considerations</i>		
• life cycle cost	88	
• funding availability	80	Line item is funded.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing technology.

IDOA Score: Technical 63 Total 75

Waste Stream Number & Name: SR-W042 Paints and Thinners
Option Number: SR-W042-1
Facility: CIF Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 52	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 208	
1.3.2 Safety Assurance Documentation	\$ 52	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 0	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 357
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 223	
2.2 Inspection	\$ 71	
2.3 Project Management	\$ 116	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 15	
2.6 Construction Management	\$ 71	
2.7 Contingency	\$ 539	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2035
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 53	
3.2 Annual Utilities	\$ 2	
3.3 Annual Materials	\$ 32	
3.4 Annual Maintenance	\$ 19	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 105	
X NUMBER OF YEARS OF OPERATION	1.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 105
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 812	
4.2 Closure, Post-Closure, Monitoring	\$ 3	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 815
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 50
SUB COST FOR INCINERATOR MODULE		\$ 3361
ESCALATION		1.23
TOTAL COST		\$ 4134

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W042 Paints and Thinners
Option Number: SR-W042-2
Facility: INEL/WEDF Treatment Technology Stabilization

Treatment Technology

The INEL WEDF Stabilization process provides treatments for aqueous and organic liquids and debris. The process stabilizes waste in a grout matrix to reduce leachability.

Pros

- No secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	No secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.

Waste Stream Number & Name: SR-W042 Paints and Thinners

Option Number: SR-W042-2

Facility: INEL/WEDF

Treatment Technology Stabilization

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon state approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the States acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	20	Funding for treatment cost can be provide using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 65

Waste Stream Number & Name: SR-W042 Paints and Thinners
Option Number: SR-W042-2
Facility: INEL/WEDF Treatment Technology Stabilization
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 11
7.0 Transportation		\$ 18
8.0 Disposal		\$ 200
SUB COST FOR INCINERATOR MODULE		\$ 229
ESCALATION		1.06
TOTAL COST		\$ 243

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W042 Paints and Thinners

Option Number: SR-W042-3

Facility: INEL/WERF

Treatment Technology Incineration

Treatment Technology

INEL WERF Incinerator is a ram feed, stationary kiln incinerator. The facility is used to treat both solid and liquid waste. The system offgas is passes through a dry quench tower to remove contaminated prior to the release of the gas effluents. The facility cannot be used to treat wastes contaminated with chlorides. Chlorides react to create acids which, over time, will disintegrate the dry offgas system. The ash solids are removed and stabilized for disposal.

Pros

- Incineration will reduce the waste volume by a factor of 100 to 1.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The process has been demonstrated on similar waste types.
- 20% or less down time is anticipated when using this process.
- Process failure is not anticipated to result in the creation of a waste that cannot be treated.

Cons

- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The 80% of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
- Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration at INEL is anticipated to drop will the additional treatment of offsite wastes.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
Process Parameters		
• volume alteration	80	Incineration will reduce the waste volume by a factor of 100 to 1.
• secondary waste generation	50	An additional amount of ash waste, in the range of 10%, is generated, which can be handled by existing technologies.
• destruction removal and demobilization efficiency	50	Additional LDR treatments required for waste streams contaminated with non-organic contaminated (heavy metals).
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	50	The ash waste must be stabilized in a group matrix prior to shipment.
• final waste form	50	The ash waste after stabilization is anticipated to meet the SRS disposal WAC.
Engineering Parameters		
• system implementability	80	The process has been demonstrated on similar waste types.
• availability	80	20% or less down time is anticipated when using this process.
• scalability	20	The process currently exists, so any expansion would require process modifications.

Waste Stream Number & Name: SR-W042 Paints and Thinners
Option Number: SR-W042-3
Facility: INEL/WERF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• remedial measures	80	Process failure is not anticipated to result in the creation of a waste that cannot be treated.
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	50	Emissions from the facility could result during potential accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the state's acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The 80% of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	20	Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration at INEL is anticipated to drop with the additional treatment of offsite wastes.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	50	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because existing commercial technology.
• private sector involvement	20	Facility is GOCO.

IDOA Score: Technical 45 Total 59

Waste Stream Number & Name: SR-W042 Paints and Thinners
Option Number: SR-W042-3
Facility: INEL/WERF Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 80
7.0 Transportation		\$ 387
8.0 Disposal		\$ 100
SUB COST FOR INCINERATOR MODULE		\$ 567
ESCALATION		1.06
TOTAL COST		\$ 601

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Summary Page – Initial Screening

Waste Stream Number & Name: SR-W043 Laboratory Waste with Tetraphenyl Borate

Background Information

This waste stream is laboratory waste, including filters, wipes, plastic and glassware, resulting from analytical testing activities. The lab waste is coated with tetraphenyl borate which degrades to form benzene.

Volume

- Current volume through 09/30/93 is 0.2 m³.
- Expected 1993-1997 volume will be 2.6 m³.

Waste Stream Composition

- Organic Debris

Waste Code

- D018 (TCLP benzene)

LDR Treatment Standard

- D018 = no treatment standard yet developed by EPA

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high.
- No TCLP on the waste stream but tetraphenyl borate likely fails TCLP for benzene because it degrades to form benzene.

Radiological Characterization

- Current inventory of waste was generated in an RMMA but not likely to contain contamination.
- Future waste streams will be radiologically contaminated.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Ashcrete	Ashcrete does not remove the characteristic organics. Resulting waste form would not meet LDR requirements.
ETF	Wastewater	ETF has no process to treat solvents.
LETF	Wastewater	Wastewater treatment is not designed to treat a solvent system.
M-Area	Vitrification	Vitrifier is not an incinerator. It is not designed to burn an organic stream.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W043 Laboratory Waste with Tetraphenyl Borate

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W043-1	CIF	Incineration	94	64	77	82	√
SR-W043-2	INEL/WEDF	Stabilization	*	51	65	72	
SR-W043-3	INEL/WERF	Incineration	*	45	59	125	

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

- No options were rejected.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Laboratory Waste with Tetraphenyl Borate is Incineration in the Consolidated Incineration Facility (CIF).

This option treats the hazardous characteristic, ignitability, by conversion of the combustible fraction to carbon dioxide and water, and stabilizing residuals with cement.

This option is preferred because:

- Waste volume will be reduced by a factor of at least 2.
- Final waste form will meet LDR standards.
- Incineration and ash stabilization are demonstrated technologies.
- CIF is currently under construction.
- Residual solids are stabilized with cement.
- It is a cost-effective option.
- No treatability studies will be needed.

Options Rejected During IDOA

Stabilization at INEL/WEDF

Stabilization at INEL/WEDF (encapsulating the waste with a grout matrix) was rejected because:

- Stabilization is not the specified technology for this waste stream.

Incineration at INEL/WERF

Incineration at INEL/WERF was rejected because:

- Cost of pretreatment (shredding and packaging) will not be avoided
- Offsite incineration offers neither technological nor environmental advantage over the preferred option.
- Apparent cost advantage over the preferred option is a consequence of the accounting methods stipulated, which do not consider overhead and capital costs of offsite facilities.

Waste Stream Number & Name: SR-W043 Laboratory Waste with Tetraphenyl Borate
Option Number: SR-W043-1
Facility: CIF Treatment Technology Incineration

Treatment Cycle Flow Diagram:

Pros

- Expect at least 5:1 reduction.
- The waste stream is expected to meet all applicable LDR standards after treatment by this facility.
- Incinerator designed for a wide range of wastes with some operational limitations.
- Waste form meets shipping requirements without additional treatment.
- The waste form meets the expected WAC. Waste form is suitable for disposal in the form it exits the process.
- Incineration is a current demonstrated technology.
- Process failure will not create a waste that can not be treated by existing processes.
- Reasonably easy to schedule this waste stream assuming current startup schedule.
- Little increase to the environment or public health is expected from this waste stream because there will be little or no emissions from this facility even in an accident.
- Processes are in full compliance with the regulations and no variance is required to treat this waste.
- Line item is funded.
- 100% of the final waste form will go to the LLW Vaults.

Cons

- The public has limited acceptance of incineration and publicly questioned the safety of incineration.
- Additional non-routine maintenance required.

Waste Stream Number & Name: SR-W043 Laboratory Waste with Tetraphenyl Borate
Option Number: SR-W043-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	80	Expect at least 5:1 reduction.
• secondary waste generation	50	Significant volume of secondary waste due to non-combustible sludge and it can be treated by existing technology.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because the waste stream is expected to meet all applicable LDR standards after treatment by this facility.
• flexibility	80	Incinerator designed for a wide range of wastes with some operational limitations.
• ability to be shipped	80	Waste form meets shipping requirements without additional treatment.
• final waste form	100	The waste form meets the expected WAC. Add 20 points to the median score of 80 because waste form see suitable for disposal in the form it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because incineration is a current demonstrated technology.
• availability	50	Incinerator availability for solids is 50%. Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load.
• scalability	50	Capacity is set by design and accepts a wide range of inputs but not easily expanded. Excess capacity does exist at this time.
• remedial measures	80	Process failure will not create a waste that can not be treated by existing processes.
• schedule for treatment of waste	80	Reasonably easy to schedule this waste stream assuming current startup schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Little increase to the environment or public health is expected from this waste stream because there will be little or no emissions from this facility even in an accident.
• non-operational worker potential exposure	70	Subtract 10 points from the median score of 80 because additional non-routine maintenance required.
• operational worker potential exposure	80	No impact due to this waste stream.
• transportation potential exposure	60	Few shipments are required because of this waste. Add 10 points to the median score of 50 because no additional characterization is needed to support transportation.
<i>Regulatory Parameters</i>		
• need for variance	80	Processes are in full compliance with the regulations and no variance is required to treat this waste.
• ability to obtain a permit	80	This waste is part of the basis for permitting.
• waste disposal	80	100% of the final waste form will go to the LLW disposal.

Waste Stream Number & Name: SR-W043 Laboratory Waste with Tetraphenyl Borate
Option Number: SR-W043-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Public Acceptance</i>		
• public acceptance	20	The public has limited acceptance of incineration and publicly questioned the safety of incineration.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	80	Line item is funded.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing technology.

IDOA Score: Technical 64 Total 77

Waste Stream Number & Name: SR-W043 Laboratory Waste with Tetraphenyl Borate
Option Number: SR-W043-1
Facility: CIF Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 0	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 0	
1.3.2 Safety Assurance Documentation	\$ 0	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 0	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 0
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 0	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 0	
2.7 Contingency	\$ 0	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 30	
3.2 Annual Utilities	\$ 1	
3.3 Annual Materials	\$ 18	
3.4 Annual Maintenance	\$ 11	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 60	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 15
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 3	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 3
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 50
SUB COST FOR INCINERATOR MODULE		\$ 68
ESCALATION		1.206
TOTAL COST		\$ 83

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W043 Laboratory Waste with Tetraphenyl Borate
Option Number: SR-W043-2
Facility: INEL/WEDF Treatment Technology Stabilization

Treatment Technology

The INEL WEDF Stabilization process provides treatments for aqueous and organic liquids and debris. The process stabilizes waste in a grout matrix to reduce leachability.

Pros

- No secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	No secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.

Waste Stream Number & Name: SR-W043 Laboratory Waste with Tetraphenyl Borate
Option Number: SR-W043-2
Facility: INEL/WEDF Treatment Technology Stabilization
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon state approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the states acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	50	Funding for treatment cost can be provide using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 65

Waste Stream Number & Name: SR-W043 Laboratory Waste with Tetraphenyl Borate
Option Number: SR-W043-2
Facility: INEL/WEDF Treatment Technology Stabilization
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 0.2
7.0 Transportation		\$ 18
8.0 Disposal		\$ 50
SUB COST FOR INCINERATOR MODULE		\$ 68
ESCALATION		\$ 1.06
TOTAL COST		\$ 72

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W043 Laboratory Waste with Tetraphenyl Borate
Option Number: SR-W043-3
Facility: INEL/WERF Treatment Technology Incineration

Treatment Technology

INEL WERF Incinerator is a ram feed, stationary kiln incinerator. The facility is used to treat both solid and liquid waste. The system offgas is passes through a dry quench tower to remove contaminated prior to the release of the gas effluents. The facility cannot be used to treat wastes contaminated with chlorides. Chlorides react to create acids which, over time, will disintegrate the dry offgas system. The ash solids are removed and stabilized for disposal.

Pros

- Incineration will reduce the waste volume by a factor of 100 to 1.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The process has been demonstrated on similar waste types.
- 20% or less down time is anticipated when using this process.
- Process failure is not anticipated to result in the creation of a waste that cannot be treated.

Cons

- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
- Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration at INEL is anticipated to drop will the additional treatment of offsite wastes.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
Process Parameters		
• volume alteration	80	Incineration will reduce the waste volume by a factor of 100 to 1.
• secondary waste generation	50	An additional amount of ash waste, in the range of 10%, is generated, which can be handled by existing technologies.
• destruction removal and demobilization efficiency	50	Additional LDR treatments required for waste streams contaminated with non-organic contaminated (heavy metals).
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	50	The ash waste must be stabilized in a group matrix prior to shipment.
• final waste form	50	The ash waste after stabilization is anticipated to meet the SRS disposal WAC.
Engineering Parameters		
• system implementability	80	The process has been demonstrated on similar waste types.
• availability	80	20% or less down time is anticipated when using this process.
• scalability	20	The process currently exists, so any expansion would require process modifications.

Waste Stream Number & Name: SR-W043 Laboratory Waste with Tetraphenyl Borate
Option Number: SR-W043-3
Facility: INEL/WERF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• remedial measures	80	Process failure is not anticipated to result in the creation of a waste that cannot be treated.
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	50	Emissions from the facility could result during potential accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the States acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	20	Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration at INEL is anticipated to drop with the additional treatment of offsite wastes.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	50	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing commercial technology.
• private sector involvement	20	Facility is GOCO.

IDOA Score: Technical 45 Total 59

Waste Stream Number & Name: SR-W043 Laboratory Waste with Tetraphenyl Borate
Option Number: SR-W043-3
Facility: INEL/WERF Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$.209
7.0 Transportation		\$ 17.6
8.0 Disposal		\$ 100
SUB COST FOR INCINERATOR MODULE		\$ 118
ESCALATION		\$ 1.06
TOTAL COST		\$ 125

Note: Per DOE directions this cost carries no overhead burden or capital costs.

Summary Page

Waste Stream Number & Name: SR-W044 Tributyl Phosphate and n-Paraffin - TRU

Background Information

Part of the Plutonium Uranium Extraction (PUREX) Process in the separations areas, this waste stream is an organic solvent. This waste stream has been combined with waste stream SR-W045, Mixed Low-Level Waste Tributyl Phosphate and n-Paraffin, because of similar treatment requirements.

This waste stream has been combined with waste stream SR-W045, Tributyl Phosphate and n-Paraffin.

This waste stream will be deleted from the Mixed Waste Inventory Report and the Site Treatment Plan.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W045 Tributyl Phosphate and n-Paraffin

Background Information

An organic solvent generated in the Plutonium/Uranium Extraction Process (PUREX) used in the Separations areas. During the SRS DSTP process, the program to consolidate waste streams SR-W044 Tributyl Phosphate and n-Paraffin (TRU) with SR-W045 was completed. These waste streams will be reported as SR-W045.

Volume

- Current volume through 09/30/93 is 107 m³.
- No future waste generation expected because changes to solvent extraction practices in canyon separations process should no longer have degenerated solvent being RCRA hazardous (just LLW). Do not expect future generation because of process modifications, product substitutions, etc.

Waste Stream Composition

- Organic Liquid

Waste Code

- D008A (TCLP Pb), D009A (TCLP Hg), D011A (TCLP Ag), D018 (benzene), D040 (trichloroethylene) nonwastewater

LDR Treatment Standard

- D008, D009, D011 = concentration based standard = 0.2 - 5.0 mg/l
- D018, D040 = no treatment standard yet developed by EPA

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high because sampling and analysis is available.

Radiological Characterization

- Total activity ranges 8-16 nCi/g.
- Cm²⁴⁴, Am²⁴¹, Pu²³⁹, Eu¹⁵⁴, Eu¹⁵⁵, Pu²³⁸, and lesser amounts of Zr⁹⁵, Sb¹²⁵, Cs¹³⁷, Co⁶⁰.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Ashcrete	Ashcrete does not remove the characteristic organics. Resulting waste form would not meet LDR requirements.
ETF	Wastewater	ETF has no process to treat solvents.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
LETF	Wastewater	Wastewater treatment is not designed to treat a solvent stream.
M-Area	Vitrification	Vitrifier is not an incinerator. It is not designed to burn an organic stream.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W045 Tributyl Phosphate and n-Paraffin

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF	IDOA Scores		COST (x 1000)	PO
			Score	Tech.	Total		
SR-W045-1	CIF	Incineration	94	64	78	92	√
SR-W045-2	Vendor	Fluidized Bed Combustion	13				
SR-W045-3	Vendor	Catalyzed Wet Oxidation	1				
SR-W045-4	Vendor	Pyrolysis	1				

Options Rejected Due To Low Technology Success Factor

Catalyzed Wet Oxidation by Vendor

Catalyzed wet oxidation by vendor was rejected because:

- Catalyzed wet oxidation is a bench-scale chemical reaction that has no current field application.
- It is unknown that this reaction can be scaled up to an industrial facility. Hence $P_m=0.9$.
- Control of such a reactor is undefined and must be assumed to require complex systems. Hence $P_c=0.9$.

Pyrolysis by Vendor

Pyrolysis by vendor was rejected because:

- The pyrolyzer in this system is pilot scale. Hence $P_m=0.9$.
- Control of cutting-edge incineration technology is far more complex than that required by standard incineration systems, which in itself is not simple. Hence, $P_c=0.9$.

Fluidized Bed Combustion by Vendor

Fluidized bed combustion by vendor was rejected because:

- Fluidized bed combustion is an emerging technology.
- Although it has application in other areas, this vendor currently has no units operating in the field combusting mixed waste. Hence $P_m=0.8$.
- Controls for cutting-edge incineration equipment can be expected to be highly complex. Hence, $P_c=0.8$.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Tributyl Phosphate and n-Paraffin is Incineration in the Consolidated Incineration Facility (CIF).

This option treats the constituents of concern, heavy metals and the hazardous characteristic, ignitability, by conversion of the combustible fraction to carbon dioxide and water, and stabilizing residuals with cement.

This option is preferred because:

- Waste volume will be reduced by a factor of at least 2.

- Final waste form will meet LDR standards.
- Incineration and ash stabilization are demonstrated technologies.
- CIF is currently under construction.
- Residual solids are stabilized with cement.
- It is a cost-effective option.
- No treatability studies are needed.

Waste Stream Number & Name: SR-W045 Tributyl Phosphate and n-Paraffin
Option Number: SR-W045-1
Facility: CIF Treatment Technology Incineration

Treatment Cycle Flow Diagram:

Pros

- Expect at least 30:1 reduction.
- Fairly low ash content waste stream results in a small quantity of secondary waste being generated that can be treated by existing technologies.
- The waste stream is expected to meet all applicable LDR standards after treatment with the processes in this facility.
- Incinerator designed for a wide range of wastes with some operational limitations.
- Waste does not require any additional treatment to meet shipping requirements.
- The waste form meets the expected WAC for disposal in the form it exits the facility.
- Incineration is a current demonstrated technology.
- Incinerator availability for liquids is 70%. Normal maintenance requirements apply.
- Process failure should not create a waste that cannot be treated by existing technologies.
- Little increase to the environment or public health is expected from this waste stream because little or no facility emissions even during most accidents. The waste will be treated over a long period by blending small amounts with other wastes.
- No additional non-operational workers are required for treatment of this waste but additional non-routine maintenance will be required.
- Process is in full compliance with existing regulations and no variances are required to treat this waste.
- 100% of the final waste form will go to the LLW disposal.

Cons

- The public has significant concerns about this process and has publicly expressed concern about the safety of the process.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	90	Add 10 points to the median score of 80 because expect at least 30:1 reduction.
• secondary waste generation	80	Fairly low ash content waste stream results in a small quantity of secondary waste being generated that can be treated by existing technologies.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because the waste stream is expected to meet all applicable LDR standards after treatment with the processes in this facility.

Waste Stream Number & Name: SR-W045 Tributyl Phosphate and n-Paraffin
Option Number: SR-W045-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• flexibility	80	Incinerator designed for a wide range of wastes with some operational limitations.
• ability to be shipped	80	Waste does not require any additional treatment to meet shipping requirements.
• final waste form	100	Add 20 points to the median score of 80 because the waste form meets the expected WAC for disposal in the form it exits the facility.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because incineration is a current demonstrated technology.
• availability	70	Incinerator availability for liquids is 70%. Normal maintenance requirements apply. Subtract 10 points from the median score of 80 because this waste stream may require a "clean-out" earlier than anticipated based on curle load.
• scalability	50	Capacity is set by design and existing design will accept a wide range of inputs, but it is not easily expanded. Excess capacity does exist at this time.
• remedial measures	80	Presence of metals in the secondary wastes might require rework, but a process failure should not create a waste that cannot be treated by existing technologies.
• schedule for treatment of waste	40	Subtract 10 points from the median score of 50 because of the high rad. content, will have to work off waste over a number of years.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Little increase to the environment or public health is expected from this waste stream because little or no facility emissions even during most accidents. The waste will be treated over a long period by blending small amounts with other wastes.
• non-operational worker potential exposure	70	No additional non-operational workers are required for treatment of this waste. Subtract 10 points from the median score of 80 because additional non-routine maintenance will be required.
• operational worker potential exposure	40	Subtract 10 points from the median score of 50 because additional system clean-outs will be required due to the high rad content of this waste stream increasing the potential for exposure.
• transportation potential exposure	50	Transportation is required but it will be in small volumes and no additional characterization is needed.
<i>Regulatory Parameters</i>		
• need for variance	80	Process is in full compliance with existing regulations and no variances are required to treat this waste.
• ability to obtain a permit	100	Add 20 points to the median score of 80 because this waste is part of the basis for permitting.
• waste disposal	80	100% of the final waste form will go to the LLW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Process has limited public acceptance. Public has expressed concern about the safety of the process.

Waste Stream Number & Name: SR-W045 Tributyl Phosphate and n-Paraffin
Option Number: SR-W045-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	80	Line item is funded.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because technology is being purchased.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing technology.

IDOA Score: Technical 64 Total 78

Waste Stream Number & Name: SR-W045 Tributyl Phosphate and n-Paraffin
Option Number: SR-W045-1
Facility: CIF Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 0	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 0	
1.3.2 Safety Assurance Documentation	\$ 0	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 0	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 0
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 0	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 0	
2.7 Contingency	\$ 0	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 45	
3.2 Annual Utilities	\$ 2	
3.3 Annual Materials	\$ 27	
3.4 Annual Maintenance	\$ 16	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 90	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 23
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 3	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 3
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 50
SUB COST FOR INCINERATOR MODULE		\$ 75
ESCALATION		1.23
TOTAL COST		\$ 92

Note: Includes cost of treating SR-W044 which has been combined with SR-W045.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W045
Option Number: SR-W045-2
Facility: Vendor

Tributyl Phosphate and n-Paraffin
Treatment Technology Fluidized Bed
Combustion

Option rejected during technical success factor evaluation. No further analysis performed.

Waste Stream Number & Name: SR-W045
Option Number: SR-W045-3
Facility: Vendor

Tributyl Phosphate and n-Paraffin

Treatment Technology Wet Oxidation

Option rejected during technical success factor evaluation. No further analysis performed.

Waste Stream Number & Name: SR-W045
Option Number: SR-W045-4
Facility: Vendor

Tributyl Phosphate and n-Paraffin
Treatment Technology Pyrolysis

Option rejected during technical success factor evaluation. No further analysis performed.

Summary Page

Waste Stream Number & Name: SR-W046 Consolidated Incinerator (CIF) Ash

Background Information

A future waste stream composed of ash generated from the incineration of mixed waste in the CIF.

Volume

- Expected 1993-1997 volume generation is 62 m³.

Waste Stream Composition

- Inorganic Sludge/Particulate

Waste Code

- Numerous waste codes from feed waste/derived from rule. The ash waste stream will contain all of the listed waste codes that are fed into the CIF. Consult the Part B Permit Application for a complete listing.

LDR Treatment Standard

- Standards are too numerous to list. See the standards listed in 40 CFR 268.41-43.

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium based on the fact that this is a future waste stream and no analysis is available.

Radiological Characterization

- Radiological hazards are unknown at this time.
- Remote handled by design of the facility.
- Mixed low-level waste

Preferred Option

The preferred treatment option for Consolidated Incineration Facility (CIF) Ash is Stabilization using the Consolidated Incineration Facility Ashcrete Process.

Treatment Justification

In-depth options analysis is not required for this waste stream since a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

The CIF is designed to include integrated ash stabilization, the Ashcrete unit, for the treatment of CIF incinerator ash (SR-W046). The Ashcrete unit is directly coupled to the CIF rotary kiln which will allow the ash to be stabilized in an environmentally safe form before it leaves the controlled environment and is transported to a waste storage or disposal facility. Other options for the treatment of CIF ash would entail the shipment of unstabilized ash and would incur the additional cost of providing another treatment facility. Treatment of CIF ash in the unit is the preferred option because it addresses the concerns of shipping unstabilized ash and additional treatment facility costs.

Waste Stream Number & Name: SR-W046 Consolidated Incinerator (CIF) Ash
Facility: CIF Ashcrete Process Treatment Technology Stabilization
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☐ contact handled ☒ remote handled (by design)

Module Location: SRS

Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 0	
1.2 Demonstration Costs	\$ 0	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 0	
1.3.2 Safety Assurance Documentation	\$ 88	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 2116	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ 2204
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ 87	
2.3 Project Management	\$ 119	
2.4 Building Construction (inc. indirect)	\$ 283	
2.5 Equipment (inc. indirect)	\$ 176	
2.6 Construction Management	\$ 75	
2.7 Contingency	\$ 316	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 1056
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 0.3	
3.2 Annual Utilities	\$ 0.0	
3.3 Annual Materials	\$ 0.2	
3.4 Annual Maintenance	\$ 0.1	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 0.6	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 1
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 4457	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 4457
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$ 0
6.0 Offsite Treatment (DOE)		\$ 0
7.0 Transportation		\$ 0
8.0 Disposal (5 drums of ashcrete)		\$ 8
SUB COST FOR MODULE		\$ 7726
ESCALATION		1.060
TOTAL COST		\$ 8190

This cost represents the share of the SR-W001 costs attributable directly to operation of the ashcrete equipment following incineration of SR-W001, SR-W002, SR-W003, SR-W010, SR-W012, SR-W022, SR-W030, SR-W035. As such, this cost estimate SHOULD NOT be added to the overall cost of treating SRS mixed waste. These costs have already been captured on the cost estimate sheet for SR-W001.

If above numbers do not appear to add correctly, it is the result of computer rounding.

Summary Page – Initial Screening

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown

Background Information

A future waste stream composed of scrubber blowdown water (wastewater) from the Consolidated Incineration Facility (CIF) offgas emission control system.

Volume

- Expected 1993-1997 volume generation is 400 m³.

Waste Stream Composition

- Aqueous Liquid

Waste Code

- Numerous waste codes from feed waste/derived from rule. Blowdown waste stream will contain all of the listed waste codes that are fed into the CIF. Consult the Part B Permit Application for a complete listing.

LDR Treatment Standard

- Standards are too numerous to list. See the standards at 40 CFR 268.41-43.

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium based on the fact this is a future waste stream and no analysis available.

Radiological Characterization

- Tritium present, alpha and beta/gamma emitters
- Activity level is <10 nCi/g
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
ETF	Wastewater	ETF has no process to treat CIF blowdown.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W047-1	CIF	Ashcrete	94	56	60	25890	✓
SR-W047-2	M-Area	LETf	13	60	62	30519	
SR-W047-3	M-Area	Vitrification	38	54	54	38950	

Options Rejected Due To Low Technology Success Factor

Wastewater Treatment M-Area LETf

Wastewater treatment M-Area LETf was rejected because:

- This facility is not currently configured to treat waste in the volume anticipated for this stream.
- Additional equipment would have to be designed and installed. Hence, $P_m=0.9$.
- Mixture of heavy metals in the waste could require several additional types of standard and advanced technology for treatment. Hence, $P_c=0.7$.

It should be noted that an IDOA was conducted on this treatment option only because of a specific request to include it as an option.

Vitrification by M-Area Vendor Treatment Process Vendor

Vitrification by M-Area Vendor Treatment Process vendor was rejected because:

- This waste has not been tested by the vitrification vendor for compatibility with the process. Hence, $P_m=0.9$.
- Vitrification unit is not currently designed to process the proposed quantities of liquid waste. Tankage, feed systems and control upgrades are expected to be needed. Hence, $P_c=0.5$.

It should be noted that an IDOA was conducted on this treatment option only because of a specific request to include it as an option.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Consolidated Incineration Facility Blowdown waste stream is stabilization in the Consolidated Incineration Ashcrete Facility.

This option treats the constituents of concern, heavy metals and radionuclides, by stabilizing them with cement.

This option is preferred because:

- Final waste form meets LDR.
- Process has been successfully employed at other DOE and commercial facilities.
- It is cost-efficient.
- It enables CIF to meet the current start-up schedule.
- Other treatment methods require extensive additional research and development.

Studies are ongoing of ways to stabilize CIF scrubber blowdown with cement. Researchers are using a blowdown simulant to determine:

- Proportions of blowdown liquid, containing various constituents of concern, cement, and other additives to form blowcrete.
- Solidification of blowcrete with various constituents of concern in the simulant.
- Ability of the solidified material to meet LDR standards.

Options Rejected During IDOA

Stabilization and Vitrification in M-Area

Stabilization or vitrification in M-Area were rejected because:

- Rejected options not viable per TSF.
- Rejected options do not support CIF start-up schedule.

Note: IDOA done at the request of M-area personnel.

Results of Previous Evaluations of Alternative Treatments for CIF Scrubber Blowdown

Treatment of CIF offgas scrubber blowdown (SR-W047) was originally planned as cement stabilization at the proposed M-Area Waste Disposal Facility (Y-Area). This facility was to consist of a waste processing system and concrete vaults for bulk stabilization and disposal of an aqueous M-Area waste stream. However, a more cost effective treatment was found for the M-Area waste and that waste was eventually withdrawn from the scope of Y-Area. Construction and operation of Y-Area to treat only CIF blowdown was then not justified. Investigations were initiated to develop alternatives for blowdown treatment. A comprehensive evaluation, "Final Study on Alternative Solutions for Treatment of the CIF Blowdown" (SWE-CIF-930043), was completed in 1993. It incorporated and expanded upon the earlier investigations and made a recommendation for treatment for blowdown.

The study focused on the use of existing SRS treatment processes, a redesign of the CIF, and procurement of a vendor treatment process. The study evaluated the following alternatives:

CIF Ashcrete

Blowdown would be transferred to the existing CIF ashcrete stabilization unit where it would be solidified with Portland cement in drums. After hardening, drums of solidified blowdown would be transported to an SRS storage or disposal facility.

High-Level Waste Tank Farm

Blowdown would be transferred to an SRS High-Level Waste tank. After solids settled, the liquid would be processed by an existing High-Level Waste evaporator. The evaporator overheads would be treated at the F/H Effluent Treatment Facility (ETF) and discharged. Blowdown solids would be treated along with High-Level Waste in the Z-Area Saltstone facility and the Defense Waste Processing Facility.

Effluent Treatment Facility (ETF)

Blowdown would be transferred directly to the ETF where it would be treated to remove contaminants. The treated wastewater would then be discharged. Blowdown solids would be transferred from ETF to the Z-Area Saltstone facility via Tank 50 for cement stabilization and disposal.

Z-Area Saltstone

In this option blowdown would be transferred directly to Tank 50 in the High-Level Waste tank farm where it would be mixed other aqueous wastes. The combined waste would be transferred to Z-Area for cement stabilization and disposal.

M-Area Liquid Effluent Treatment Facility (LETf)

This process would dewater CIF blowdown using hydroxide precipitation and filtration. Treated blowdown liquid would then be discharged and blowdown solids would be stabilized by the M-Area Vendor Treatment Process Treatment facility.

Naval Fuels Wastewater Treatment Facility (WWTF)

The Naval Fuels WWTF would dewater blowdown in an existing forced circulation evaporator. Evaporated water vapor would be vented while the concentrated solids would be cement-stabilized in drums for disposal.

211-F Evaporator

In this option blowdown would be transferred blowdown to the General Purpose Evaporator 211-F in the F-Area Tank Farm. Condensed evaporator overheads would be further treated at the ETF. Concentrated blowdown solids would be transferred to the High-Level Waste system for treatment along with high-level waste solids.

Conversion of CIF to a "Zero-Liquid Discharge Facility"

This alternative would convert the CIF offgas system to a semi-dry process utilizing a spray dryer ahead of a wet scrubber. Scrubber blowdown would be recycled to the spray dryer resulting in no CIF liquid waste being generated. A dry solid waste stream would be generated in the spray dryer that included blowdown solids.

Vendor Treatment

A vendor would be contracted to supply and operate an onsite dewatering and stabilization process of the vendor's design that would meet RCRA treatment and disposal requirements. The process would drum the stabilized waste.

The study ranked the alternatives by establishing weighted evaluation criteria and scoring each alternative against the criteria. The scores for each alternative were summed and the alternative with the highest sum was selected as the best treatment option. Evaluation criteria included technical feasibility, life-cycle cost of, environmental permitting considerations, and effect on the CIF schedule including impact to the CIF operation date commitment made by SRS in the Land Disposal Restrictions Federal Facilities Compliance Agreement. The cost and technical feasibility criteria were each assigned a weight of 35%. The permitting and schedule criteria, which were found to be interdependent, were assigned a weight of 30%.

The ranking process showed the stabilizing of blowdown in the CIF Ashcrete Unit to be the best option primarily due to life cycle cost. Treatment in the M-Area LETF was the second ranking alternative. The life cycle cost of the Ashcrete Unit option was determined to be \$25.8MM, followed by the M-Area LETF at \$29.8MM.

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown
Option Number: SR-W047-1
Facility: CIF Treatment Technology Ashcrete

Treatment Cycle Flow Diagram:

Pros

- No secondary waste generated by this method.
- No additional treatment is required to meet LDR.
- Waste form can be easily shipped as-is.
- The waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- This is a proven process, used both in DOE-complex and the commercial world.
- Schedule for processing this waste can be determined based on the facility startup schedule.
- Process results in few or no uncontrolled emissions during routine operations. Metals in the liquid waste will be encapsulated in the ashcrete.
- Addition of this waste stream to those routinely handled by CIF in the ashcrete system will not increase exposure to non-operational workers but will require increased non-routine maintenance.
- Addition of this waste stream to those routinely handled by CIF in the ashcrete system will not increase the number of required operational workers. Potential increase in exposure to operational workers.
- Well accepted waste form. No variance required.
- Funding will be made available from CIF contingency, or management reserve.
- Facility is currently under construction.

Cons

- The waste volume will more than double.
- All wastes must go to HW/MW disposal.
- Waste form is not as permanent as other forms of stabilization.
- Must demonstrate that waste meets treatment standards.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because the waste volume will more than double.
• secondary waste generation	100	Add 20 points to the median score of 80 because no secondary waste generated by this method.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	50	Because this stream is not in the original design, care must be taken to handle variations in composition.
• ability to be shipped	80	Waste form can be easily shipped as-is.

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown
Option Number: SR-W047-1
Facility: CIF Treatment Technology Ashcrete
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• final waste form	100	The waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because this is a proven process, used both in DOE-complex and the commercial world.
• availability	50	Normal maintenance requirements are unaffected, but increased curie loading may necessitate more frequent clean-outs.
• scalability	50	Through-put is set by design, and not easily expanded.
• remedial measures	40	Subtract 10 points from the median score of 50 because failed waste form can be ground up and reprocessed. Additional problems caused by metal concentrations in the ashcrete.
• schedule for treatment of waste	80	Schedule for processing this waste can be determined based on the facility startup schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process results in few or no uncontrolled emissions during routine operations. Metals in the liquid waste will be encapsulated in the ashcrete.
• non-operational worker potential exposure	70	Addition of this waste stream to those routinely handled by CIF in the ashcrete system will not increase exposure to non-operational workers. Subtract 10 points from the median score of 80 because will require increased non-routine maintenance.
• operational worker potential exposure	70	Addition of this waste stream to those routinely handled by CIF in the ashcrete system will not increase the number of required operational workers. Subtract 10 points from the median score of 80 because potential increase in exposure to operational workers.
• transportation potential exposure	50	Waste can be handled readily. Frequent, short distance transportation will be required.
<i>Regulatory Parameters</i>		
• need for variance	80	Well accepted waste form. No variance required.
• ability to obtain a permit	50	Must demonstrate that waste meets treatment standards.
• waste disposal	20	All wastes must go to HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	26	
• funding availability	80	Funding will be made available from CIF contingency, or management reserve.

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown
Option Number: SR-W047-1
Facility: CIF Treatment Technology Ashcrete
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because modification to a commercial incinerator.
• private sector involvement	100	Add 20 points to the median score of 80 because facility is currently under construction.

IDOA Score: Technical 56 Total 60

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown
Option Number: SR-W047-1
Facility: CIF Treatment Technology Ashcrete
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 5	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 18	
1.3.2 Safety Assurance Documentation	\$ 5	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 178
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 22	
2.2 Inspection	\$ 4	
2.3 Project Management	\$ 4	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 100	
2.6 Construction Management	\$ 7	
2.7 Contingency	\$ 48	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 185
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 251	
3.2 Annual Utilities	\$ 10	
3.3 Annual Materials	\$ 151	
3.4 Annual Maintenance	\$ 90	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 503	
X NUMBER OF YEARS OF OPERATION	20.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 10050
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 250	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 250
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 5000
SUB COST FOR ASHCRETE STABILIZATION MODULE		\$ 15663
ESCALATION		1.653
TOTAL COST		\$ 25890

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown
Option Number: SR-W047-2
Facility: M-Area Treatment Technology LETF

Treatment Cycle Flow Diagram:

Pros

- Expect >5:1 reduction.
- Small amount of secondary waste may be produced and it can be treated by existing technologies.
- No additional treatment is necessary to meet LDR.
- No significant efficiency loss is expected for off-design input.
- Waste form requires no additional treatment to meet shipping requirements.
- Will end up at NPDES outfall and treated filter cake will meet disposal WAC.
- All parts of operation have been successfully demonstrated.
- Adding additional filters is easy making adding additional capacity not a problem.
- Process failure does not generate waste that can not be treated by existing technologies.
- Small emissions but no scenario for catastrophic event. Low volume stored. Little or no emissions during normal operations and in accidents because of the small volume of waste stored.
- No additional operation workers required, but there is an increase in the potential for exposure due to the radionuclides.
- Processes are in full compliance with existing regulations and no variances are required to treat waste.
- No difficulty is expected in permitting because a similar process has been previously permitted.

Cons

- SAR issues, system complexity. Non-technical concerns.
- Significant increase in operating funds required.
- Waste must go to HW/MW.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	90	Add 10 points to the median score of 80 because expect >5:1 reduction.
• secondary waste generation	80	Small amount of secondary waste may be produced and it can be treated by existing technologies.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is necessary to meet LDR.
• flexibility	80	No significant efficiency loss is expected for off-design input.

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown
Option Number: SR-W047-2
Facility: M-Area Treatment Technology LETF
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• ability to be shipped	80	Waste form requires no additional treatment to meet shipping requirements.
• final waste form	100	Will end up at NPDES outfall. Add 20 points to the median score of 80 because treated filter cake will meet disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	All parts of operation have been successfully demonstrated.
• availability	50	Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load.
• scalability	90	Add 10 points to the median score of 80 because adding additional filters is easy making adding additional capacity not a problem.
• remedial measures	80	Process failure does not generate waste that can not be treated by existing technologies.
• schedule for treatment of waste	20	SAR issues, system complexity. Non-technical concerns.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Small emissions but no scenario for catastrophic event. Low volume stored. Little or no emissions during normal operations and in accidents because of the small volume of waste stored.
• non-operational worker potential exposure	40	Subtract 10 points from the median score of 50 because processing this waste increases the complexity of M-Area requiring more non routine maintenance.
• operational worker potential exposure	70	No additional operation workers required. Subtract 10 points from the median score of 80 because there is an increase in the potential for exposure due to the radionuclides.
• transportation potential exposure	40	Subtract 10 points from the median score of 50 because will require special transport – shipping 5000 gal. tank truck and frequent trips of relatively short distance onsite.
<i>Regulatory Parameters</i>		
• need for variance	80	Processes are in full compliance with existing regulations and no variances are required to treat waste.
• ability to obtain a permit	80	Similar to ETF WW permit (same constituents) and no difficulty is expected in permitting because a similar process has been previously permitted.
• waste disposal	20	All waste must go to HW/MW.
<i>Public Acceptance</i>		
• public acceptance	50	Public has expressed approval of glass waste form.
<i>Cost Considerations</i>		
• life cycle cost	13	
• funding availability	20	Significant increase in operating funds required.

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown
Option Number: SR-W047-2
Facility: M-Area Treatment Technology LETF
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because vendor process employed integrally.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 60 Total 62

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown
Option Number: SR-W047-2
Facility: M-Area Treatment Technology LETF
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 88	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 352	
1.3.2 Safety Assurance Documentation	\$ 88	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 5	
TOTAL PRE-OPERATIONS		\$ 682
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 418	
2.2 Inspection	\$ 72	
2.3 Project Management	\$ 77	
2.4 Building Construction (inc. indirect)	\$ 100	
2.5 Equipment (inc. indirect)	\$ 1800	
2.6 Construction Management	\$ 133	
2.7 Contingency	\$ 911	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 3511
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 188	
3.2 Annual Utilities	\$ 8	
3.3 Annual Materials	\$ 113	
3.4 Annual Maintenance	\$ 68	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 375	
X NUMBER OF YEARS OF OPERATION	20.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 7500
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 1520	
4.2 Closure, Post-Closure, Monitoring	\$ 250	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1770
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 5000
SUB COST FOR LETF MODULE		\$ 18463
ESCALATION		1.653
TOTAL COST		\$ 30519

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown
Option Number: SR-W047-3
Facility: M-Area Treatment Technology Vitrification

Treatment Cycle Flow Diagram:

Pros

- Expect >5:1 reduction.
- Small quantity of secondary waste and can be handled by existing technologies.
- No additional requirement is needed to meet LDR.
- System allows for wide range of input.
- Waste form does not require additional treatment to meet shipping requirements.
- Glass will meet final disposal WAC in the form it exits the process.
- Process failure does not generate a waste that can not be handled by existing technologies.
- Little or no facility emissions during operation and most accidents.
- No change in exposure potential because no additional operation personnel are required.
- In full compliance with existing regulations and no variances are needed.

Cons

- Process capacity is set by design and not easily expandable and current schedule requires 24 hrs/day operation.
- System is not permanent and large uncertainties exist in developing schedules.
- Waste will require HW/MW disposal.
- Significant increase in operating dollars required.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
Process Parameters		
• volume alteration	90	Add 10 points to the median score of 80 because expect >5:1 reduction.
• secondary waste generation	80	Small quantity of secondary waste and can be handled by existing technologies.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional requirement is needed to meet LDR.
• flexibility	80	System allows for wide range of input.
• ability to be shipped	80	Waste form does not require additional treatment to meet shipping requirements.
• final waste form	100	Add 20 points to the median score of 80 because glass will meet final disposal WAC in the form it exits the process.

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown
Option Number: SR-W047-3
Facility: M-Area Treatment Technology Vitrification
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
Engineering Parameters		
• system implementability	50	Pyro. hydrolysis reaction/dechlorination hasn't been demonstrated.
• availability	50	Similar processes have availability of 50%.
• scalability	20	Process capacity is set by design and not easily expandable and current schedule requires 24 hrs/day operation.
• remedial measures	80	Process failure does not generate a waste that can not be handled by existing technologies.
• schedule for treatment of waste	20	System is not permanent and large uncertainties exist in developing schedules.
Personnel Parameters		
• consequence of unmitigated accident scenarios	80	Little or no facility emissions during operation and most accidents.
• non-operational worker potential exposure	40	Process requires average number of non operation personnel. Subtract 10 points from the median score of 50 because more non routine maintenance due to clean outs.
• operational worker potential exposure	80	No change in exposure potential because no additional operation personnel are required.
• transportation potential exposure	40	Subtract 10 points from the median score of 50 because frequent shipments of this waste onsite will be required, though not over long distances.
Regulatory Parameters		
• need for variance	80	In full compliance with existing regulations and no variances are needed.
• ability to obtain a permit	50	Similar processes have been permitted else where but there is some key differences in waste stream characterization. Would require a modification to existing wastewater permit. SCDHEC could require a RCRA Part B Permit Application with change in waste stream.
• waste disposal	20	Waste will require HW/MW disposal.
Public Acceptance		
• public acceptance	50	Public has expressed approval of glass waste form.
Cost Considerations		
• life cycle cost	0	
• funding availability	20	Significant increase in operating dollars required.
Industry Involvement		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 54 Total 54

Waste Stream Number & Name: SR-W047 Consolidated Incinerator (CIF) Blowdown
Option Number: SR-W047-3
Facility: M-Area Treatment Technology Vitrification
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 166	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 666	
1.3.2 Safety Assurance Documentation	\$ 166	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 5	
TOTAL PRE-OPERATIONS		\$ 1278
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 792	
2.2 Inspection	\$ 140	
2.3 Project Management	\$ 145	
2.4 Building Construction (inc. indirect)	\$ 100	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 252	
2.7 Contingency	\$ 1727	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 3155
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 188	
3.2 Annual Utilities	\$ 8	
3.3 Annual Materials	\$ 113	
3.4 Annual Maintenance	\$ 68	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 375	
X NUMBER OF YEARS OF OPERATION	20.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 7500
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 2880	
4.2 Closure, Post-Closure, Monitoring	\$ 250	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 3130
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 3500	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 3500
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 5000
SUB COST FOR INCINERATOR MODULE		\$ 23563
ESCALATION		1.653
TOTAL COST		\$ 38950

If above numbers do not appear to add correctly, it is the result of computer rounding.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil

Background Information

This waste consists of soils, sand, and associated debris (rocks, wood, etc.) resulting from cleanup activities of spills and remedial actions.

Volume

- Current volume through 09/30/93 is 18.2 m³.
- No future waste generation expected.

Waste Stream Composition

- Uncategorized soils

Waste Code

- D004A through D011A (TCLP metals)
- D012 through D0041 (characteristic organics)

LDR Treatment Standard

- D004A-D011A concentration based standard = 0.2 mg/l-100 mg/l
- D012 - D017 concentration based standards = 0.066 - 10 mg/kg
- D018 - D043 = no treatment standard yet developed by EPA

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high based on process knowledge of what was spilled or located at a particular site.

Radiological Characterization

- Beta/Gamma and Alpha emitter.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Ashcrete	Ashcrete does not have the capacity to treat large amounts of soil.
CIF	Combustion	CIF is not designed to burn large amounts of soil.
ETF	Wastewater	ETF has no process to treat this waste.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
LETF	Wastewater	LETF has no process to treat large amounts of soil.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W048-1	M-Area	Vitrification	63	59	71	3780	√
SR-W048-2	Vendor/Onsite	Stabilization	75	61	67	21406	
SR-W048-3	Vendor/Onsite	Polymer Encapsulation	100	57	67	10632	
SR-W048-4	Vendor/Onsite	Soil Wash	75	48	56	15567	
SR-W048-5	HW/MW-TB	Soil Wash	51	48	48	37017	
SR-W048-6	Vendor/Onsite	Chelation	81	47	56	12673	
SR-W048-7	INEL/IWPF	Incineration	*	35	49	356	
SR-W048-8	Vendor	Plasma Hearth	1				
SR-W048-9	Cont. Bldg.	Metal Migration	26				
SR-W048-10	Vendor	Vitrification	38				
SR-W048-11	Vendor	Plasma Arc	1				

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

Plasma Arc Remediation by Vendor

Plasma arc remediation by vendor was rejected because:

- Plasma arc incineration is currently still in the laboratory.
- While prototypes may exist, they have no record of continuous reliable operation in industrial settings. Hence, $P_m=0.9$.
- Control of the process requires sophisticated computerized instrumentation. Hence, $P_c=0.9$.
- It is not expected for this technology to reach a level of reliability suitable for industrial application for 5-10 years.

Plasma Hearth Process by Vendor

Plasma Hearth Process by vendor was rejected because:

- Plasma hearth incineration is currently still in the laboratory. While prototypes may exist, they have no record of continuous reliable operation in industrial settings. Hence, $P_m=0.9$.
- Control of the process requires sophisticated computerized instrumentation. Hence, $P_c=0.9$.
- It is not expected for this technology to reach a level of reliability suitable for industrial application for 5-10 years.

Metal Migration in Containment Building

Metal migration in containment building was rejected because:

- This process has shown promise only for *in situ* remediation of soil. The process for decontaminating excavated soils is laboratory scale. Hence $P_m=0.9$.
- Control of this process to ensure appropriate levels of decontamination will be difficult and complex. Hence, $P_c=0.5$.

Vitrification by Vendor

Vitrification by vendor was rejected because:

- This unit currently exists as a pilot scale process that can handle only non-hazardous simulated waste. Hence, $P_m=0.7$.
- This is a vitrification process for which solid feed systems and sophisticated controls are expected to be needed. Hence, $P_c=0.5$.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Waste Sites/Spill Site Soil waste stream is Vitrification in the M-Area Vendor Treatment Process.

This option treats the constituents of concern, TCLP metals and characteristic organics, by stabilizing it in non-leaching glass matrix.

This option is preferred because:

- Volume reduction will be greater than a factor of 5.
- Treatment meets LDR.
- This small volume waste stream can be easily processed along with the wastes for which the vendor vitrification unit was originally contracted.
- The final waste form is very stable and long-lived.
- It is cost effective.

Treatability Study Requirements

Waste must first be characterized:

- Percent of silica, silt, and clay
- Percent of silicon, sodium, calcium, magnesium, and aluminum

If the characteristics fall within the standard glass-forming matrix, no additional studies will be necessary. If the characteristics fall outside the standard glass-forming matrix, crucible studies will be needed to determine whether satisfactory glass can be made by using additives, or other techniques.

Options Rejected During IDOA

Stabilization by Vendors

Stabilization (either by polymer or cement grout) by vendors was rejected because:

- Waste volume more than doubles
- Final waste form not as long-lived as preferred option.
- Rejected options not as cost-effective as preferred option.

Soil Washing (either by a Vendor or in HW/MW-TB)

Soil washing (either by a vendor or in HW/MW-TB) was rejected because:

- Final waste still required handling as mixed waste.
- Volume of waste increased due to need to treat secondary waste water.

Incineration at INEL/IWPF

Incineration at INEL/IWPF was rejected because:

- INEL/IWPF is a planned, but not approved facility. DOE guidance forbids consideration of such facilities.
- Apparent cost advantage over the preferred option is a consequence of the accounting methods stipulated, which do not consider overhead and capital costs of offsite facilities.

Chelation by a Vendor

Chelation by a vendor was rejected because:

- Final waste still required handling as mixed waste.
- Volume of waste increased due to need to treat secondary waste water.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-1
Facility: M-Area Vendor Treatment Process Treatment Technology Vitrification

Treatment Cycle Flow Diagram:

Pros

- Reduction between 5:1 and 1:1.
- No additional treatment is required to meet LDR.
- Final glass form will meet all shipping requirements.
- Glass will meet final disposal WAC. No additional treatment is required. Waste form is disposable in form which exits the process.
- Process demonstrated for vitrification.
- Failed waste form can be easily recycled through melter with little or not additional rework.
- Any potential releases within permit limits.
- No increase in non-operational workers is required to treat the waste but increase in non-routine maintenance will be required.
- Process will be in full compliance without requiring a variance.

Cons

- Not a budgeted item.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	70	Subtract 10 points from the median score of 80 because reduction between 5:1 and 1:1, reduction is <5:1.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	50	Off design will reduce efficiency. Sieve required.
• ability to be shipped	80	Final glass form will meet all shipping requirements.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-1
Facility: M-Area Vendor Treatment Process Treatment Technology Vitrification
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• final waste form	100	Glass will meet final disposal WAC. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in form which exits the process.
<i>Engineering Parameters</i>		
• system implementability	80	Process demonstrated for vitrification.
• availability	50	Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load.
• scalability	50	Fixed quantity of waste. Throughput is set by design and not easily expanded except by adding more shifts of operation.
• remedial measures	80	Recoverable. Failed waste form can be easily recycled through melter with little or not additional rework.
• schedule for treatment of waste	80	Fixed quantity easily scheduled.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Potential releases but within permit limits.
• non-operational worker potential exposure	70	No increase in non-operational workers is required to treat the waste. Subtract 10 points from the median score of 80 because increase in non-routine maintenance will be required.
• operational worker potential exposure	40	Subtract 10 points from the median score of 50 because potential safety issue with added processes.
• transportation potential exposure	60	Site has experience with transporting soils. Add 10 points to the median score of 50 because no additional characterization needed.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be in full compliance without requiring a variance.
• ability to obtain a permit	50	Similar process permitted elsewhere, but will require a permit modification to the existing wastewater permit. DHEC could require a RCRA Part B Permit Application with change in waste stream.
• waste disposal	50	All waste will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public has supported treatment that results in a glass waste form.
<i>Cost Considerations</i>		
• life cycle cost	88	
• funding availability	20	Not a budgeted item.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because minimal potential for similar waste streams. Existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because private sector has evinced significant interest. Existing vendor process.

IDOA Score: Technical 59 Total 71

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-1
Facility: M-Area Vendor Treatment Process Treatment Technology Vitrification
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 14	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 56	
1.3.2 Safety Assurance Documentation	\$ 14	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 1150	
1.3.5 Project Management	\$ 5	
TOTAL PRE-OPERATIONS		\$ 1363
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 66	
2.2 Inspection	\$ 8	
2.3 Project Management	\$ 13	
2.4 Building Construction (inc. indirect)	\$ 100	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 21	
2.7 Contingency	\$ 144	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 352
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 263	
3.2 Annual Utilities	\$ 11	
3.3 Annual Materials	\$ 158	
3.4 Annual Maintenance	\$ 95	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 525	
X NUMBER OF YEARS OF OPERATION	1.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 525
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 240	
4.2 Closure, Post-Closure, Monitoring	\$ 5	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 245
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 200	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 200
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 100
SUB COST FOR VITRIFICATION MODULE		\$ 2785
ESCALATION		1.558
TOTAL COST		\$ 4338

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W048
Option Number: SR-W048-2
Facility: Vendor/Onsite

Waste Sites/Spill Site Soil
Treatment Technology Stabilization

Treatment Cycle Flow Diagram:

Pros

- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form can be easily shipped as-is.
- The waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- This is a proven process, used both in DOE-complex and the commercial world.
- Similar systems in the commercial nuclear industry experience availability of 80%.
- Requires fewer non-operational workers than comparably sized facilities. Experience in similar facilities indicates that little non-routine maintenance is needed
- Well accepted waste form. No variance required.
- All wastes disposed of as LLW because meets treatment standards.

Cons

- Waste volume will more than double.
- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because waste volume will more than double.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-2
Facility: Vendor/Onsite Treatment Technology Stabilization
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form can be easily shipped as-is.
• final waste form	100	The waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	This is a proven process. Add 20 points to the median score of 80 because used both in DOE-complex and the commercial world.
• availability	80	Similar systems in the commercial nuclear industry experience availability of 80%.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form can be over-packed, or ground up and reprocessed.
• schedule for treatment of waste	70	This is a mature technology. Subtract 10 points from the median score of 80 because the process is neither skid-mounted nor currently available in the U. S.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	80	Requires fewer non-operational workers than comparably sized facilities. Experience in similar facilities indicates that little non-routine maintenance is needed.
• operational worker potential exposure	50	Facility requires about the same number of operational workers as comparably sized facilities.
• transportation potential exposure	60	No additional testing needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Well accepted waste form. No variance required.
• ability to obtain a permit	80	Must demonstrate that waste meets treatment standard.
• waste disposal	80	All wastes disposed of as LLW because meets treatment standards.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	39	
• funding availability	20	Not a budgeted item, will require line item funding.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-2
Facility: Vendor/Onsite Treatment Technology Stabilization
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 61 Total 67

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-2
Facility: Vendor/Onsite Treatment Technology Stabilization
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 256	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 1023	
1.3.2 Safety Assurance Documentation	\$ 256	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 180	
TOTAL PRE-OPERATIONS		\$ 1990
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 880	
2.2 Inspection	\$ 280	
2.3 Project Management	\$ 460	
2.4 Building Construction (inc. indirect)	\$ 4000	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 280	
2.7 Contingency	\$ 2653	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 8553
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 375	
3.2 Annual Utilities	\$ 15	
3.3 Annual Materials	\$ 225	
3.4 Annual Maintenance	\$ 135	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 750	
X NUMBER OF YEARS OF OPERATION	1.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 750
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 4400	
4.2 Closure, Post-Closure, Monitoring	\$ 10	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 4410
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 1500	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 1500
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 200
SUB COST FOR CEMENT STABILIZATION MODULE		\$ 17403
ESCALATION		1.23
TOTAL COST		\$ 21406

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-3
Facility: Vendor/Onsite Treatment Technology Polymer Encapsulation

Treatment Cycle Flow Diagram:

Pros

- No additional treatment is required to meet LDR.
- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form meets shipping requirements in the form it exits the treatment process.
- The waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- This is a proven process, used both in DOE-complex and the commercial world.
- Mature technology. Vendor will bring onsite and set up with a minimum delay.
- Process can be installed in a building with adequate emission controls.
- Skid mounted, no D&D, vendor removes upon completion of work. Facility requires more non-operational workers than comparably sized, skid mounted facilities.
- Well accepted waste form. No variance required.

Cons

- The waste volume will far more than double.
- Waste form is not as permanent as other forms of stabilization.
- Not a budgeted item, will require line item funding.
- Waste requires HW/MW disposal.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
Process Parameters		
• volume alteration	0	Subtract 20 points from the median score of 20 because the waste volume will far more than double.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.

Waste Stream Number & Name: SR-W048
Option Number: SR-W048-3
Facility: Vendor/Onsite
In-Depth Options Analysis Score Sheet

Waste Sites/Spill Site Soil
Treatment Technology Polymer
Encapsulation

Attribute	Score	Discussion/Notes
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.
• final waste form	100	The waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	This is a proven process. Add 20 points to the median score of 80 because this process is used both in DOE-complex and the commercial world.
• availability	60	Operator error can cause downtime. Add 10 points to the median score of 50 because system is normally available 50% of the time.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form can be ground up and reprocessed.
• schedule for treatment of waste	80	Mature technology. Vendor will bring onsite and set up with a minimum delay.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	70	Requires the same number of non-operational workers as comparable skid-mounted units. Most or all initial construction can be done in a vendor shop. Experience in similar facilities indicates that little non-routine maintenance is required. Subtract 10 points from median score of 80 because of uncertainties surrounding D&D efforts.
• operational worker potential exposure	40	Subtract 10 points from the median score of 50 because the facility requires more operational workers than comparably sized, skid mounted facilities.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Well accepted waste form. No variance required.
• ability to obtain a permit	80	Must demonstrate that waste meets treatment standard.
• waste disposal	20	Waste requires HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	70	
• funding availability	20	Not a budgeted item, will require line item funding.

Waste Stream Number & Name: SR-W048

Waste Sites/Spill Site Soil

Option Number: SR-W048-3

Facility: Vendor/Onsite

Treatment Technology

Polymer

In-Depth Options Analysis Score Sheet

Encapsulation

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score:

Technical

57

Total

67

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-3
Facility: Vendor/Onsite Treatment Technology Polymer
Cost Estimate Sheet Encapsulation

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 128	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 512	
1.3.2 Safety Assurance Documentation	\$ 128	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 90	
TOTAL PRE-OPERATIONS		\$ 1132
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 440	
2.2 Inspection	\$ 140	
2.3 Project Management	\$ 230	
2.4 Building Construction (inc. indirect)	\$ 2000	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 140	
2.7 Contingency	\$ 1327	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 4277
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 38	
3.2 Annual Utilities	\$ 2	
3.3 Annual Materials	\$ 23	
3.4 Annual Maintenance	\$ 14	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 75	
X NUMBER OF YEARS OF OPERATION	1.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 75
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 2200	
4.2 Closure, Post-Closure, Monitoring	\$ 10	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 2210
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 750	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 750
6.0 Offsite Treatment (DOE)	\$	
7.0 Transportation	\$	
8.0 Disposal	\$ 200	
SUB COST FOR POLYMER EMULSIFICATIONS MODULE		\$ 8644
ESCALATION	1.23	
TOTAL COST		\$ 10632

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Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-4
Facility: Vendor/Onsite Treatment Technology Soil Wash

Treatment Cycle Flow Diagram:

Pros

- No additional treatment is required to meet LDR.
- Capable of handling wide variations in the composition of the design waste stream.
- Meets the expected WAC for disposal. Additional secondary waste treatment is required. Waste is disposable in the form in which it exits the process.
- Most elements have been demonstrated.
- Process will be designed to comply with applicable regulations without seeking a variance.

Cons

- Constituent of concern is not permanently and irreversibly isolated from the environment. Although the soil is clean, constituents of concern must be stabilized by some other technology.
- Not a budgeted item. Will require line funding.
- Wastes will require HW/MW disposal.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
Process Parameters		
• volume alteration	50	Little or no reduction in volume.
• secondary waste generation	50	Wash water is a secondary waste that must be treated and stabilized with routine technology. Volume of stabilized secondary waste may equal volume of original waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Designed to decontaminate soil, but other wastes may possibly be decontaminated with the same process with few additional process steps (e.g., shredding). Capable of handling wide variations in the composition of the design waste stream.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-4
Facility: Vendor/Onsite Treatment Technology Soil Wash
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• ability to be shipped	50	Treatment residuals require further treatment to meet shipping requirements.
• final waste form	80	Meets the expected WAC for disposal. Additional secondary waste treatment is required. Waste is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	70	Most elements have been demonstrated, but not as an integrated system. Subtract 10 points from the median score of 80 because no plant-scale facilities exist in the U. S.
• availability	50	Based on projections from European facilities, it seems likely that the availability will be around 50%.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	If washed soil fails to meet release specifications, it can be recycled, or stabilized by other routine technology.
• schedule for treatment of waste	50	Because process has not been unequivocally demonstrated to treat the waste, uncertainties remain about the accuracy of a schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	50	Facility is expected to require the same number of non-operational workers as comparably sized cement mix plants, in which material handling (not cement mixing) is somewhat analogous to this treatment process.
• operational worker potential exposure	40	Subtract 10 points from the median score of 50 because the facility is expected to require more operational workers per shift than wastewater treatment facilities owing to an expected number of manual laborers needed to handle the waste, which is in boxes.
• transportation potential exposure	50	Some additional characterization needed. Waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be designed to comply with applicable regulations without seeking a variance.
• ability to obtain a permit	60	Must demonstrate that waste meets treatment standard. New process in the U. S., unfamiliar to regulators. Add 10 points to the median score of 50 because operating background from European facilities will should help allay concerns.
• waste disposal	20	Wastes will require HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Constituent of concern is not permanently and irreversibly isolated from the environment. Although the soil is clean, constituents of concern must be stabilized by some other technology.
<i>Cost Considerations</i>		
• life cycle cost	0	

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: 3K-W048-4
Facility: Vendor/Onsite Treatment Technology Soil Wash
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• funding availability	20	Not a budgeted item. Will require line funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 48 Total 56

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-4
Facility: Vendor/Onsite Treatment Technology Soil Wash
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 187	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 748	
1.3.2 Safety Assurance Documentation	\$ 187	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 90	
TOTAL PRE-OPERATIONS		\$ 1487
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 440	
2.2 Inspection	\$ 140	
2.3 Project Management	\$ 230	
2.4 Building Construction (inc. indirect)	\$ 2000	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 140	
2.7 Contingency	\$ 1939	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 4889
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 38	
3.2 Annual Utilities	\$ 2	
3.3 Annual Materials	\$ 23	
3.4 Annual Maintenance	\$ 14	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 75	
X NUMBER OF YEARS OF OPERATION	1.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 75
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 3600	
4.2 Closure, Post-Closure, Monitoring	\$ 5.00	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 3605
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 2500	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 2500
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 100
SUB COST FOR INCINERATOR MODULE		\$ 12656
ESCALATION		1.23
TOTAL COST		\$ 15567

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W048
Option Number: SR-W048-5
Facility: HW/MW-TB

Waste Sites/Spill Site Soil
Treatment Technology Soil Washing

Treatment Cycle Flow Diagram:

Pros

- No additional treatment is required to meet LDR.
- Capable of handling wide variations in the composition of the design waste stream.
- Meets the expected WAC for disposal. Waste form is disposable in the form in which it exits the process.
- Most elements have been demonstrated.
- Process will be designed to comply with applicable regulations without seeking a variance.

Cons

- Although the soil is clean, constituents of concern must be stabilized by some other technology.
- Not a budgeted item, will require line item funding.
- Wastes will require HW/MW disposal.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	50	No volume reduction.
• secondary waste generation	50	Wash water is a secondary waste that must be treated and stabilized with routine technology. Volume of stabilized secondary waste may equal volume of original waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Designed to decontaminate soil, but other wastes may possibly be decontaminated with the same process with few additional process steps (e.g., shredding). Capable of handling wide variations in the composition of the design waste stream.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-5
Facility: HW/MW-TB Treatment Technology Soil Washing
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• ability to be shipped	50	Treatment residuals require further treatment to meet shipping requirements.
• final waste form	80	Meets the expected WAC for disposal. Additional secondary waste treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	70	Most elements have been demonstrated, but not as an integrated system. Subtract 10 points from the median score of 80 because no plant-scale facilities exist in the U.S.
• availability	40	Subtract 10 points from the median score of 50 because based on projections from European facilities, availability will be around 50%. Availability will be affected by wear on moving parts caused by handling an abrasive slurry, and time required to maintain process equipment contaminated by radionuclides.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	If washed soil fails to meet release specifications, it can be recycled, or stabilized by other routine technology.
• schedule for treatment of waste	40	Subtract 10 points from the median score of 50 because process has not been unequivocally demonstrated to treat the waste, uncertainties remain about the accuracy of a schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	50	Facility is expected to require the same number of non-operational workers as comparably sized cement mix facilities in which material handling (not cement mixing) is somewhat analogous to this treatment process.
• operational worker potential exposure	40	Subtract 10 points from the median score of 50 because facility is expected to require more operational workers per shift than wastewater treatment facilities owing to an expected number of manual laborers needed to handle waste, which is in boxes.
• transportation potential exposure	50	Some additional characterization needed. Waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be designed to comply with applicable regulations without seeking a variance.
• ability to obtain a permit	60	Must demonstrate that waste meets treatment standard. Add 10 points to the median score of 50 because new process in the U.S., unfamiliar to regulators. Operating background from European facilities should allay concerns.
• waste disposal	20	Wastes will require HW/MW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Although the soil is clean, constituents of concern must be stabilized by some other technology.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-5
Facility: HW/MW-TB Treatment Technology Soil Washing
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Cost Considerations</i>		
• life cycle cost	56	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	20	Existing vendor process.
• private sector involvement	50	Vendors with similar processes have exhibited interest in treating this waste.

IDOA Score: Technical 48 Total 48

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-5
Facility: HW/MW-TB Treatment Technology Soil Washing
Cost Estimate Sheet

INCLUDES COST FOR OPTION SR-W049-2

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 424	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 1695	
1.3.2 Safety Assurance Documentation	\$ 424	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 315	
TOTAL PRE-OPERATIONS		\$ 3133
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 1848	
2.2 Inspection	\$ 546	
2.3 Project Management	\$ 861	
2.4 Building Construction (inc. indirect)	\$ 7000	
2.5 Equipment (inc. indirect)	\$ 1400	
2.6 Construction Management	\$ 588	
2.7 Contingency	\$ 4395	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 16638
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 75	
3.2 Annual Utilities	\$ 3	
3.3 Annual Materials	\$ 45	
3.4 Annual Maintenance	\$ 27	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 150	
X NUMBER OF YEARS OF OPERATION	1.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 150
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 6720	
4.2 Closure, Post-Closure, Monitoring	\$ 5	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 6725
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 100
SUB COST FOR SOIL WASHING MODULE		\$ 26746
ESCALATION		1.384
TOTAL COST		\$ 37017

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W048
Option Number: SR-W048-6
Facility: Vendor/Onsite

Waste Sites/Spill Site Soil

Treatment Technology Chelation

Treatment Cycle Flow Diagram:

Pros

- Extractants are reused, resulting in the generation of little secondary waste.
- No additional treatment is required to meet LDR.
- Capable of handling wide variations in the composition of the design waste stream.
- Waste form meets shipping requirements in the form it exits the treatment process.
- Meets the expected WAC for disposal. Waste is disposable in the form in which it exits the process.
- Process will be designed to comply with applicable regulations without seeking a variance.

Cons

- Failed waste form would require additional stabilization. The large volume of waste that might require remediation.
- New technology. Scale-up problems could cause uncertainties in the schedule.
- Process without directly applicable operating history to demonstrate environmental acceptability will concern the public.
- Not a budgeted item, will require line item funding.
- Wastes will require HW/MW disposal.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-6
Facility: Vendor/Onsite Treatment Technology Chelation
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	50	No volume reduction.
• secondary waste generation	80	Extractants are reused, resulting in the generation of little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Designed to decontaminate soil, but other wastes may possibly be decontaminated with the same process with few additional process steps (e.g., shredding). Capable of handling wide variations in the composition of the design waste stream.
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.
• final waste form	80	Meets the expected WAC for disposal. Additional secondary waste treatment is required. Waste is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	50	Demonstrated on plant-scale, but there are no operational facilities elsewhere.
• availability	50	Process combines a rotary kiln dryer with contaminant removal process. Availability expected to be about 50%.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	30	Failed waste form would require additional stabilization. Subtract 20 points from the median score of 50 because the large volume of waste that might require remediation.
• schedule for treatment of waste	20	New technology. Scale-up problems could cause uncertainties in the schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	50	Expect process would require a number of non-operational workers similar to a wastewater treatment plant.
• operational worker potential exposure	50	Expect process would require a number of operational workers similar to a wastewater treatment plant.
• transportation potential exposure	50	Some additional characterization needed.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be designed to comply with applicable regulations without seeking a variance.
• ability to obtain a permit	50	Must demonstrate that waste meets treatment standard. Lack of operating background from other facilities may engender concerns.
• waste disposal	20	Wastes will require HW/MW disposal.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-6
Facility: Vendor/Onsite Treatment Technology Chelation
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Public Acceptance</i>		
• public acceptance	20	Process without directly applicable operating history to demonstrate environmental acceptability will concern the public.
<i>Cost Considerations</i>		
• life cycle cost	64	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is a vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is a vendor process.

IDOA Score: Technical 47 Total 56

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-6
Facility: Vendor/Onsite Treatment Technology Chelation
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☒ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 153	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 613	
1.3.2 Safety Assurance Documentation	\$ 153	
1.3.3 Permitting	\$ 125	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 90	
TOTAL PRE-OPERATIONS		\$ 1284
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 440	
2.2 Inspection	\$ 140	
2.3 Project Management	\$ 230	
2.4 Building Construction (inc. indirect)	\$ 2000	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 140	
2.7 Contingency	\$ 1589	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 4539
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 38	
3.2 Annual Utilities	\$ 2	
3.3 Annual Materials	\$ 23	
3.4 Annual Maintenance	\$ 14	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 75	
X NUMBER OF YEARS OF OPERATION	1.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 75
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 2800	
4.2 Closure, Post-Closure, Monitoring	\$ 5	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 2805
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ 1500	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$ 1500
6.0 Offsite Treatment (DOE)	\$	
7.0 Transportation	\$	
8.0 Disposal	\$ 100	
SUB COST FOR CHELATION MODULE		\$ 10303
ESCALATION		1
TOTAL COST		\$ 12673

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-7
Facility: INEL/IWPF

Treatment Technology Incineration

Treatment Technology

INEL IWPF incinerator is in the preliminary design phase. The type of kiln and offgas system have not yet been determined.

Pros

- Incineration will reduce the waste volume by more than 100 to 1.
- The facility will treat waste streams similar in composition to those assumed in the design basis without modification.
- Any ash waste generated, after stabilization, is anticipated to meet the SRS disposal WAC.
- Process failure is not anticipated to result in the creation of a waste that cannot be treated.

Cons

- The facility is in preliminary design phase, uncertain of facility design and secondary waste streams. An ash waste stream and some blowdown type wastes are anticipated.
- Uncertainties surrounding the design prevent an accurate estimation of availability.
- A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications. In addition facility operation is contingent upon the receipt of DOE funding.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The process will require Part B Permit application approval from the state. State approval for treatment of offsite waste may be difficult.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
- Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration is anticipated to drop with the additional treatment of offsite wastes.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	80	Incineration will reduce the waste volume by more than 100 to 1.
• secondary waste generation	20	The facility is in preliminary design phase, uncertain of facility design and secondary waste streams. An ash waste stream and some blowdown type wastes are anticipated.
• destruction removal and demobilization efficiency	50	Additional LDR treatment will be required for waste streams contaminated with non-organic contaminated (heavy metals).
• flexibility	80	The facility will treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	50	The ash waste, when generated, must be stabilized in a group matrix prior to shipment.
• final waste form	80	Any ash waste generated, after stabilization, is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	20	The process is currently in the preliminary design phase, final incinerator type has been selected.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-7
Facility: INEL/IWPF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• availability	20	Uncertainties surrounding the design prevent an accurate estimation of availability.
• scalability	50	The facility is currently in the preliminary design phase. Any modification required for unique waste streams could be incorporated in to the facility design.
• remedial measures	80	Process failure is not anticipated to result in the creation of a waste that cannot be treated.
• schedule for treatment of waste	20	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications. In addition facility operation is contingent upon the receipt of DOE funding.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	50	Emissions from the planned facility could result during potential accident scenarios.
• non-operational worker potential exposure	50	The facility is in the early design phase, so construction of the facility will be required.
• operational worker potential exposure	50	Personnel exposure is anticipated to be average for operations of this type.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	20	The process will require Part B Permit application approval from the state. State approval for treatment of offsite waste may be difficult.
• ability to obtain a permit	50	Permitting process is well defined, however, the States acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	20	Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration is anticipated to drop with the additional treatment of offsite wastes.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	50	Funding for treatment cost can be provide using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%. (Line item funding is being pursued by the facility contractor)
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing commercial technology.
• private sector involvement	20	Facility is GOCO.

IDOA Score: Technical 35 Total 49

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-7
Facility: INEL/IWPF Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 210
7.0 Transportation		\$ 26
8.0 Disposal		\$ 100
SUB COST FOR INCINERATOR MODULE		\$ 336
ESCALATION		1.06
TOTAL COST		\$ 356

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-8
Facility: Vendor

Treatment Technology Plasma Hearth

Option rejected during technical success factor evaluation. No further analysis performed.

Waste Stream Number & Name: SR-W048
Option Number: SR-W048-9
Facility: Containment Building

Waste Sites/Spill Site Soil
Treatment Technology Metal Migration

Option rejected during technical success factor evaluation. No further analysis performed.

Waste Stream Number & Name: SR-W048
Option Number: SR-W048-10
Facility: Vendor

Waste Sites/Spill Site Soil
Treatment Technology: Vitrification

Option rejected during technical success factor evaluation. No further analysis performed.

Waste Stream Number & Name: SR-W048 Waste Sites/Spill Site Soil
Option Number: SR-W048-11
Facility: Vendor

Treatment Technology Plasma Arc

Option rejected during technical success factor evaluation. No further analysis performed.

Summary Page – Initial Screening

Waste Stream Number & Name: SR-W049 Tank E-3-1 Clean Out Material

Background Information

The waste stream consists of mercury contaminated rocks, dirt, sand, concrete, and glass cleaned out of the bottom of Tank E-3-1, a sump receipt tank in H-Area.

Volume

- Current volume through 09/30/93 is 1.4 m³.
- No future waste generation expected as this is a one time generation.

Waste Stream Composition

- Inorganic Sludges

Waste Code

- D009A (TCLP Hg) nonwastewater

LDR Treatment Standard

- Concentration based standard = 0.2 mg/l

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high based upon analytical results.
- TCLP indicates typical mercury concentration is 14 mg/l.

Radiological Characterization

- Activity level is <80 d/m/ml.
- Beta/gamma emitter
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Combustion	CIF is not designed to burn rocks.
ETF	Wastewater	ETF has no process to treat this waste.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
M-Area	Vitrification	Vitrifier has no provision to control volatilized Hg.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page -- Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W049 Tank E-3-1 Clean Out Material

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W049-1	INEL/WEDF	Stabilization	*	51	65	96	√
SR-W049-2	CIF	Ashcrete	75	52	63	6830	
SR-W049-3	HW/MW-TB	Soil Washing	51	48	62	SR-W048-5	
SR-W049-4	Cont. Bldg.	Metal Migration	26				

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

Metal Migration in Containment Building

Metal migration in containment building was rejected because:

- This process has shown promise for in situ remediation of soil. The process for decontaminating excavated soils is laboratory scale. Hence $P_m=0.9$.
- Control of this process to ensure appropriate levels of decontamination will be difficult and complex. Hence, $P_c=0.5$.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Tank E-3-1 Clean Out Material is Stabilization with grout at an offsite DOE facility; the Idaho National Engineering Laboratory/Waste Engineering Development Facility (INEL/WEDF) Stabilization Unit.

This option treats the constituent of concern, mercury, by stabilizing it with grout.

This option is preferred because:

- Final waste form will meet LDR standards.
- Facility is now existing, but not permitted for mixed waste.
- It is cost-effective.

Options Rejected During IDOA

Stabilization in CIF Ashcrete

Stabilization in CIF ashcrete was rejected because:

- The unit would require special handling and a deviation from normal operations, to process waste by only stabilization, rather than incineration followed by stabilization.
- Cost is significantly higher than the INEL option.

Soil Washing in HW/MW-TB

Soil washing in HW/MW-TB was rejected because:

- Final waste still required handling as mixed waste.
- Volume of waste increased due to need to treat secondary waste water.

Waste Stream Number & Name: SR-W049 Tank E-3-1 Clean Out Material
Option Number: SR-W049-1
Facility: INEL/WEDF Treatment Technology Stabilization

Treatment Technology

The INEL/WEDF Stabilization process provides treatments for aqueous and organic liquids and debris. The process stabilizes waste in a grout matrix to reduce leachability.

Pros

- No secondary waste streams are generated.
- Waste stream is expected to meet all applicable LDR standards through this treatment.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	No secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.

Waste Stream Number & Name: SR-W049 Tank E-3-1 Clean Out Material
Option Number: SR-W049-1
Facility: INEL/WEDF Treatment Technology Stabilization
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the state will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the States acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	50	Funding for treatment cost can be provide using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 65

Waste Stream Number & Name: SR-W049 Tank E-3-1 Clean Out Material
Option Number: SR-W049-1
Facility: INEL/WEDF Treatment Technology Stabilization
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 23
7.0 Transportation		\$ 18
8.0 Disposal		\$ 50
SUB COST FOR INCINERATOR MODULE		\$ 91
ESCALATION		1.06
TOTAL COST		\$ 96

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W049 Tank E-3-1 Clean Out Material

Option Number: SR-W049-2

Facility: CIF

Treatment Technology Ashcrete

Treatment Cycle Flow Diagram:

Pros

- No secondary waste produced by Ashcrete.
- Waste stream is expected to meet all applicable LDR standards through this treatment.
- Waste form meets shipping requirements without additional treatment.
- Meets the expected WAC. Waste form suitable for disposal in the form it exits the process.
- Ashcrete is a current demonstrated and proven technology.
- Failed waste form can be reprocessed with existing technology.
- Scheduling this small volume of waste will present few, if any, difficulties.
- The metals in this waste stream will be captured in the ashcrete. Very little emissions results in little or no emissions even during an accident.
- No additional maintenance work or non-operational workers expected.
- Well accepted final waste form. No variance required.
- Line item is funded.

Cons

- Expected to increase volume by factor of 3.
- 100% of the final waste form will go to HW/MW Disposal.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because expected to increase volume by factor of 3.
• secondary waste generation	100	Add 20 points to the median score of 80 because no secondary waste produced by Ashcrete.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because waste stream is expected to meet all applicable LDR standards through this treatment.
• flexibility	50	Waste handling of waste streams directly in ashcrete is an off-normal process, which lowers efficiency.

Waste Stream Number & Name: SR-W049 Tank E-3-1 Clean Out Material
Option Number: SR-W049-2
Facility: CIF Treatment Technology Ashcrete
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• ability to be shipped	80	Waste form meets shipping requirements without additional treatment.
• final waste form	80	Meets the expected WAC. Waste form suitable for disposal in the form it exits the process.
<i>Engineering Parameters</i>		
• system implementability	80	Ashcrete is a current demonstrated and proven technology.
• availability	50	Normal maintenance requirements apply. During incinerator operation, availability of ashcrete system for treatment of other waste is very limited.
• scalability	50	Limited excess capacity exists because it is set by design.
• remedial measures	80	Failed waste form can be reprocessed with existing technology.
• schedule for treatment of waste	80	Scheduling this small volume of waste will present few, if any, difficulties.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	The metals in this waste stream will be captured in the ashcrete. Very little emissions results in little or no emissions even during an accident.
• non-operational worker potential exposure	80	No additional maintenance work or non-operational workers expected.
• operational worker potential exposure	50	Increased operator handling due to this waste stream so the potential for exposure is increased.
• transportation potential exposure	50	Does not require additional characterization to support transportation and limited number of waste transports required.
<i>Regulatory Parameters</i>		
• need for variance	80	Well accepted final waste form. No variance required.
• ability to obtain a permit	50	Modification required to facilities existing permit, but must demonstrate that waste form meets LDR treatment standards.
• waste disposal	20	100% of the final waste form will go to HW/MW Disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	80	
• funding availability	80	Line item is funded.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	100	Add 20 points to the median score of 80 because ashcrete is a purchased technology.

IDOA Score: Technical: 52 Total: 63

Waste Stream Number & Name: SR-W049 Tank E-3-1 Clean Out Material
Option Number: SR-W049-2
Facility: CIF Treatment Technology Ashcrete
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 61	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 242	
1.3.2 Safety Assurance Documentation	\$ 61	
1.3.3 Permitting	\$ 1500	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 2058
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 264	
2.2 Inspection	\$ 78	
2.3 Project Management	\$ 123	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 200	
2.6 Construction Management	\$ 84	
2.7 Contingency	\$ 628	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2377
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 210	
3.2 Annual Utilities	\$ 8	
3.3 Annual Materials	\$ 126	
3.4 Annual Maintenance	\$ 76	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 420	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 105
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 960	
4.2 Closure, Post-Closure, Monitoring	\$ 3	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 963
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 50
SUB COST FOR ASHCRETE STABILIZATION MODULE		\$ 5553
ESCALATION		1.23
TOTAL COST		\$ 6830

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W049 Tank E-3-1 Clean Out Material
Option Number: SR-W049-3
Facility: HW/MW-TB Treatment Technology Soil Washing

Treatment Cycle Flow Diagram:

Pros

- No additional treatment is required to meet LDR.
- Capable of handling wide variations in the composition of the design waste stream.
- Meets the expected WAC for disposal. Waste is disposable in the form in which it exits the process.
- Most elements have been demonstrated.
- Process will be designed to comply with applicable regulations without seeking a variance.

Cons

- Although the soil is clean, after treatment constituents of concern removed must be stabilized by some other technology.
- Not a budgeted item. Will require line funding.
- Wastes may require HW/MW disposal.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	50	No reduction in volume.
• secondary waste generation	50	Wash water is a secondary waste that must be treated and stabilized with routine technology. Volume of stabilized secondary waste may equal volume of original waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Designed to decontaminate soil, but other wastes may possibly be decontaminated with the same process with few additional process steps (e.g., shredding). Capable of handling wide variations in the composition of the design waste stream.

Waste Stream Number & Name: SR-W049 Tank E-3-1 Clean Out Material
Option Number: SR-W049-3
Facility: HW/MW-TB Treatment Technology Soil Washing
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• ability to be shipped	50	Treatment residuals require further treatment to meet shipping requirements.
• final waste form	80	Meets the expected WAC for disposal. Additional secondary waste treatment is required. Waste is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	70	Most elements have been demonstrated, but not as an integrated system. Subtract 10 points from the median score of 80 because no plant-scale facilities exist in the U. S.
• availability	40	Subtract 10 points from the median score of 50 because based on projections from European facilities, availability will be around 50%. Availability will be affected by wear on moving parts caused by handling an abrasive slurry, and time required to maintain process equipment contaminated by radionuclides.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	If washed soil fails to meet release specifications, it can be recycled, or stabilized by other routine technology.
• schedule for treatment of waste	40	Subtract 10 points from the median score of 50 because process has not been unequivocally demonstrated to treat the waste, uncertainties remain about the accuracy of a schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	50	Facility is expected to require the same number of non-operational workers as comparably sized cement mix plants, in which material handling (not cement mixing) is somewhat analogous to this treatment process.
• operational worker potential exposure	40	Subtract 10 points from the median score of 50 because the facility is expected to require more operational workers per shift than wastewater treatment facilities owing to an expected number of manual laborers needed to handle the waste, which is in boxes.
• transportation potential exposure	50	Some additional characterization needed. Waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process will be designed to comply with applicable regulations without seeking a variance.
• ability to obtain a permit	60	Must demonstrate that waste meets treatment standard. New process in the U. S., unfamiliar to regulators. Add 10 points to the median score of 50 because operating background from European facilities will should help allay concerns.
• waste disposal	20	Wastes will require HW/MW disposal.

Waste Stream Number & Name: SR-W049 Tank E-3-1 Clean Out Material
Option Number: SR-W049-3
Facility: HW/MW-TB Treatment Technology Soil Washing
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Public Acceptance</i>		
• public acceptance	20	Although the soil is clean, after treatment constituents of concern removed must be stabilized by some other technology.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	20	Not a budgeted item. Will require line funding.
<i>Industry Involvement</i>		
• market for technology	20	Similar vendor processes exist.
• private sector involvement	50	Two qualified vendors with a similar processes have exhibited interest in treating the waste.

IDOA Score: Technical 48 Total 62

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W048-5

Waste Stream Number & Name: SR-W049
Option Number: SR-W049-4
Facility: Containment Building

Tank E-3-1 Clean Out Material
Treatment Technology Metal Migration

Option rejected during technical success factor evaluation. No further analysis performed.

Summary Page

Waste Stream Number & Name: SR-W050 Mixed Waste to Support HL Waste Processing Demonstrations

Background Information

Formerly developed in the Conceptual Site Treatment Plan and the Interim MWIR as In-Tank Precipitation Samples, this waste is generated by laboratory research, development and analytical programs at the SRTC to support the DWPF operations. Waste comes from demonstration of the DWPF and ITP process samples to support DWPF operations.

Volume

- Current volume through 09/30/93 is 0.1 m³.
- Expected 1993-1997 volume will be 0.4 m³.

Waste Stream Composition

- Organic Sludge/Particulate

Waste Code

- D007B (high-level waste Cr), D009F (high-level waste Hg), D018 (benzene) nonwastewater
- Typical contaminant levels = 0.1 mg/l Cr, 10 mg/l Hg

LDR Treatment Standard

- Specified technology is vitrification of high level mixed radioactive wastes.
- D018 = no treatment standard yet developed by EPA

Waste Characterization

- Sampling and analysis used to characterize the waste stream.
- Confidence level is high because analysis was performed on simulants to indicate waste characterization.

Radiological Characterization

- Total activity is <1000 uCi/g.
- Beta/gamma emitter and Cs¹³⁷ and Sr⁹⁰ present.
- Waste is remote handled.
- High-level waste.

Preferred Option

The preferred treatment option for the Mixed Waste to Support High-Level Waste Processing Demonstrations is pretreatment in the "SRTC 90-day Containment Building" by Neutralization, Chemical Oxidation, and Ion Exchange. Residues from this pretreatment will be vitrified.

Treatment Justification

In-depth options analysis is not required for this waste stream since a Preferred Option has been identified utilizing an existing facility with existing treatment technology.

Treatment of these samples in the Savannah River Technology Center containment building laboratory meets the requirements for treatment in a 90 day containment building found in Part 262.34 and Subpart DD in Parts 264 or 265 of the RCRA regulations.

Waste Stream Number & Name: SR-W050

Mixed Waste to Support HL Waste
Processing Demonstrations

Facility: Savannah River Technology Ctr
Cost Estimate Sheet

Treatment Technology Chem. Oxidation

Waste Type: ☐ MLLW ☒ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☐ contact handled ☒ remote handled

Module Location: SRS

Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ 0
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 23.04	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$.24	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ 23.28	
X NUMBER OF YEARS OF OPERATION	3.0	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 70
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 0
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$ 0
6.0 Offsite Treatment (DOE)		\$ 0
7.0 Transportation		\$ 0
8.0 Disposal		\$ 0
SUB COST FOR CHEMICAL OXIDATION TREATMENT		\$ 70
ESCALATION		\$ 1.06
TOTAL COST		\$ 74

If above numbers do not appear to add correctly, it is the result of computer rounding.

Summary Page – Initial Screening

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges

Background Information

The waste consists of a fibrous media filter in a plastic frame used in Naval Fuels to remove particulates in the process flow stream. Mercury salt and particles of depleted uranium are the expected impurities.

Volume

- Current volume through 09/30/93 is 0.6 m³.
- No future waste generation expected because the Naval Fuels process which generated this waste is no longer operational.

Waste Stream Composition

- Heterogeneous debris

Waste Code

- D009A (low TCLP mercury)

LDR Treatment Standard

- Concentration based standard = 0.2 mg/l
- Alternative debris technology may be applied

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level high based upon knowledge that mercury is present. No direct analytical data is available, concentration of mercury is unknown.

Radiological Characterization

- Total activity is 6.6×10^{-4} Ci/kg
- Alpha emitter with U²³⁵, U²³⁸ present.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
ETF	Wastewater	ETF has no process to treat this waste.
Tritium	Macroencapsulation	Tritium has no facilities to treat solvents.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.
M-Area	Vitrification	The presence of mercury in this waste eliminates vendor vitrification as an option because the facility has no means to control mercury vapors.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W051-1	CIF	Incineration	94	61	74	346	√
SR-W051-2	Vendor/Onsite	Polymer Encapsulation	100	59	73	SR-W011-4	
SR-W051-3	HW/MW-TB	S. S. Box	100	58	72	SR-W018-4	
SR-W051-4	Cont. Bldg.	S. S. Box	94	58	72	SR-W018-3	
SR-W051-5	INEL/WERF	Incineration	*	47	61	74	
SR-W051-6	Cont. Bldg.	Acid Leach	32				
SR-W051-7	Vendor	Plasma Hearth	1				

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

Plasma Hearth Process by Vendor

Plasma hearth process by vendor was rejected because:

- Plasma hearth incineration is currently still in the laboratory. While prototypes may exist, they have no record of continuous reliable operation in industrial settings. Hence, $P_m=0.9$.
- Control of the process requires sophisticated computerized instrumentation. Hence, $P_c=0.9$.
- It is not expected for this technology to reach a level of reliability suitable for industrial application for 5-10 years.

Acid Leach in Containment Building

Acid leach in containment building was rejected because:

- Although acid leaching is a common chemical processing technique, its use on this waste stream has been demonstrated only at laboratory scale. Hence, $P_m=0.6$.
- Scale-up to a full-size processing unit contributes to the overall complexity. Hence, $P_c=0.7$.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Spent Filter Cartridges waste stream is Incineration in the CIF.

This option treats the constituents of concern, heavy metals and radionuclides, by converting the combustible fraction to carbon dioxide and water and stabilizing residuals with cement.

This option is preferred because:

- Waste volume will be reduced by a factor of at least 2.
- Final waste form will meet LDR standards.
- Incineration and ash stabilization are demonstrated technologies.
- CIF is currently under construction.
- Residual solids are stabilized with cement.

Options Rejected During IDOA

Stabilization in Ashcrete at CIF

Stabilization in ashcrete at CIF was rejected because:

- Waste volume more than doubles.
- Rejected option requires pretreatment before waste can be fed to the ashcrete facility.

Macroencapsulation in Stainless Steel Boxes (either in a Containment Building or in HW/MW-TB)

Macroencapsulation in stainless steel boxes (either in a containment building or in HW/MW-TB) was rejected because:

- Waste volume more than doubles.
- Final waste form requires disposal in HW/MW facility.

Incineration at INEL/WERF

Incineration at INEL/WERF was rejected because:

- Waste contains chlorides, which upon incineration will produce acids causing grave damage WERF's offgas system.

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges

Option Number: SR-W051-1

Facility: CIF

Treatment Technology Incineration

Treatment Cycle Flow Diagram:

Pros

- Expect at least 2:1 volume reduction.
- Waste stream is expected to meet all applicable LDR standards after treatment by this facility.
- Incinerator designed for a wide range of wastes with some operational limitations.
- Waste requires no additional treatment to meet shipping requirements.
- Final waste form meets the expected WAC upon exit from the process.
- Incineration is a current demonstrated technology, and all elements and processes have been previously demonstrated.
- Process failure should not create a waste that cannot be treated by existing technologies.
- Reasonably easy to schedule this waste stream assuming current startup schedule.
- Little increase to the environment or public health is expected from this waste stream because there will be little or no emissions from the facility even in an accident.
- Expect average numbers compared to industrial complex construction and operation.
- No impact due to this waste stream. No increase in exposure potential and no additional workers are required.
- Processes are in full compliance with all applicable regulations and no variance is needed.
- Line item is funded.
- 100% of the final waste form will go to the LLW disposal.

Cons

- The public has limited acceptance of treatment involving incineration.
- Additional non-routine maintenance required.

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges
Option Number: SR-W051-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	70	Subtract 10 points from the median score of 80 because expect at least 2:1 volume reduction.
• secondary waste generation	40	Subtract 10 points from the median score of 50 because the NaCl in the blowdown increases secondary waste treatment problems.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because waste stream is expected to meet all applicable LDR standards after treatment by this facility.
• flexibility	80	Incinerator designed for a wide range of wastes with some operational limitations.
• ability to be shipped	80	Waste requires no additional treatment to meet shipping requirements.
• final waste form	100	Add 20 points to the median score of 80 because final waste form meets the expected WAC upon exit from the process.
<i>Engineering Parameters</i>		
• system implementability	100	Incineration is a current demonstrated technology. Add 20 points to the median score of 80 because all elements and processes have been previously demonstrated.
• availability	50	Incinerator availability for solids is 50%. Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load.
• scalability	50	Process can accept a range of inputs but capacity is set by design. Excess capacity does exist at this point.
• remedial measures	70	Presence of metals in the secondary wastes might require rework. Subtract 10 points from the median score of 80 because process failure should not create a waste that cannot be treated by existing technologies.
• schedule for treatment of waste	80	Reasonably easy to schedule this waste stream assuming current startup schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Little increase to the environment or public health is expected from this waste stream because there will be little or no emissions from the facility even in an accident.
• non-operational worker potential exposure	70	Expect average numbers compared to industrial complex construction and operation. Subtract 10 points from the median score of 80 because additional non routine maintenance required.
• operational worker potential exposure	80	No impact due to this waste stream. No increase in exposure potential and no additional workers are required.
• transportation potential exposure	50	Requires transportation -- but limited additional characterization required to support transportation.
<i>Regulatory Parameters</i>		
• need for variance	80	Processes are in full compliance with all applicable regulations and no variance is needed.

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges
Option Number: SR-W051-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• ability to obtain a permit	50	Minor permit mod required, must demonstrate it meets treatment standard.
• waste disposal	80	100% of the final waste form will go to the LLW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	The public has limited acceptance of treatment involving incineration.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	80	Line item is funded.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because technology is being purchased.
• private sector involvement	100	Add 20 points to the median score of 80 because it is an existing technology.

IDOA Score: Technical 61 Total 74

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges
Option Number: SR-W051-1
Facility: CIF Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 0	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 0	
1.3.2 Safety Assurance Documentation	\$ 0	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 150
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 0	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 0	
2.7 Contingency	\$ 0	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 210	
3.2 Annual Utilities	\$ 8	
3.3 Annual Materials	\$ 126	
3.4 Annual Maintenance	\$ 76	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 420	
X NUMBER OF YEARS OF OPERATION	.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 105
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 3	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 3
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 50
SUB COST FOR INCINERATOR MODULE		\$ 308
ESCALATION		1.128
TOTAL COST		\$ 346

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges
Option Number: SR-W051-2
Facility: Vendor/Onsite Treatment Technology Polymer Encapsulation

Treatment Cycle Flow Diagram:

Pros

- Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
- Waste form meets shipping requirements in the form it exits the treatment process.
- The waste form meets the expected WAC for disposal. No additional treatment is required. Waste form is disposable in the form in which it exits the process.
- This is a proven process, used both in DOE-complex and the commercial world.
- Mature technology. Vendor will bring onsite and set up with a minimum delay.
- Skid mounted. Vendor removes equipment upon completion of work. Facility requires more non-operational workers than comparably sized, skid mounted facilities.
- Well accepted waste form. No variance required.
- Treated waste will meet treatment standards and can be disposed of as LLW.
- Little secondary waste.

Cons

- The waste volume will more than double.
- Waste form is not as permanent as other forms of stabilization.
- Not currently budgeted. Will require line item.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
Process Parameters		
• volume alteration	10	Subtract 10 points from the median score of 20 because the waste volume will more than double.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because no additional treatment is required to meet LDR.
• flexibility	80	Can accommodate a wide range of similar wastes and radiation levels. Widely used in the commercial world.
• ability to be shipped	80	Waste form meets shipping requirements in the form it exits the treatment process.

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges

Option Number: SR-W051-2

Facility: Vendor/Onsite

In-Depth Options Analysis Score Sheet

Treatment Technology Polymer
Encapsulation

Attribute	Score	Discussion/Notes
• final waste form	100	The waste form meets the expected WAC for disposal. Add 20 points to the median score of 80 because no additional treatment is required. Waste form is disposable in the form in which it exits the process.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because this is a proven process, used both in DOE-complex and the commercial world.
• availability	60	Add 10 points to the median score of 50 because system is normally available 50% of the time.
• scalability	50	Throughput is set by design, and not easily expanded except by adding more shifts of operation.
• remedial measures	50	Failed waste form can be ground up and reprocessed.
• schedule for treatment of waste	80	Mature technology. Vendor will bring onsite and set up with a minimum delay.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process can be installed in a building with adequate emission controls.
• non-operational worker potential exposure	70	Requires the same number of non-operational workers as comparable skid-mounted units. Most or all initial construction can be done in a vendor shop. Experience in similar facilities indicates that little non-routine maintenance is required. Subtract 10 points from median score of 80 because of uncertainties surrounding D&D efforts.
• operational worker potential exposure	40	Subtract 10 points from the median score of 50 because the facility requires more operational workers than comparably sized, skid mounted facilities.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	No variance required.
• ability to obtain a permit	80	Must demonstrate that waste meets treatment standard.
• waste disposal	80	Treated waste will meet treatment standards and can be disposed of as LLW.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology. Public acceptance limited because waste form is not unalterably inert.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	20	Not currently budgeted. Will require line item.

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges
Option Number: SR-W051-2
Facility: Vendor/Onsite Treatment Technology Polymer
In-Depth Options Analysis Score Sheet Encapsulation

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing vendor process.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing vendor process.

IDOA Score: Technical 59 Total 73

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W011-4

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges
Option Number: SR-W051-3
Facility: HW/MW-TB

Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- Process satisfies requirements of the "debris rule" and all applicable LDR standards are met.
- Can process a wide range of materials without loss of efficiency due to off design input.
- S. S. containers will meet current shipping requirements.
- Final waste form will meet disposal WAC.
- All processes involved are existing technology.
- Similar systems have demonstrated availability of >80%.
- Process failure does not produce altered waste form. A failed container is easily fixed.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.
- Simple welding process requiring minimal maintenance. Minimum personnel required for decommissioning.
- Exposure controlled by design and < average number of workers. Low potential for exposure.
- Little secondary waste.

Cons

- All waste will require disposal in HW/MW facilities.
- Not a budgeted item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met.
• flexibility	80	Can process a wide range of materials without loss of efficiency due to off design input.
• ability to be shipped	80	S. S. containers will meet current shipping requirements.
• final waste form	80	Final waste form will meet disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved are existing technology.
• availability	80	Similar systems have demonstrated availability of >80%.
• scalability	50	Throughput is set by design and not easily expanded except by adding additional shifts of operation.

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges
Option Number: SR-W051-3
Facility: HW/MW-TB Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• remedial measures	90	Process failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container is easily fixed.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	80	Simple welding process requiring minimal maintenance. Minimum personnel required for decommissioning.
• operational worker potential exposure	80	Exposure controlled by design and < average number of workers. Low potential for exposure.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily.
<i>Regulatory Parameters</i>		
• need for variance	80	Process satisfies requirements of the "debris rule."
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	20	All waste will require disposal in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the wasteform is not unalterably inert.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	20	Not a budgeted item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because this is an existing technology.

IDOA Score: Technical 58 Total 72

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W018-4

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges
Option Number: SR-W051-4
Facility: Containment Building Treatment Technology S. S. Box

Treatment Cycle Flow Diagram:

Pros

- Process satisfies requirements of the "debris rule" and all applicable LDR standards are met.
- Can process a wide range of materials without loss of efficiency due to off design input.
- S. S. containers will meet current shipping requirements.
- Final waste form will meet disposal WAC.
- All processes involved are existing technology.
- Similar systems have demonstrated availability of >80%.
- Process failure does not produce altered waste form. A failed container is easily fixed.
- Due to process simplicity, a schedule can be developed easily.
- Process does not create emissions related to the waste stream. Process simply involves container welding.
- Simple welding process requiring minimal maintenance. Minimal personnel required for decommissioning.
- Exposure controlled by design and < average number of workers. Low potential for exposure.
- Little secondary waste.

Cons

- All waste will require disposal in HW/MW facilities.
- Not a budget item, will require line item funding.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	40	Subtract 10 points from the median score of 50 because volume of material increases slightly due to packaging in S. S. container.
• secondary waste generation	80	Little secondary waste.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because all applicable LDR standards are met.
• flexibility	80	Can process a wide range of materials without loss of efficiency due to off design input.
• ability to be shipped	80	S. S. containers will meet current shipping requirements.
• final waste form	80	Final waste form will meet disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	90	Add 10 points to the median score of 80 because all processes involved are existing technology.
• availability	80	Similar systems have demonstrated availability of >80%.
• scalability	50	Throughput is set by design and not easily expandable except by adding shifts.

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges
Option Number: SR-W051-4
Facility: Containment Building Treatment Technology S. S. Box
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• remedial measures	90	Process failure does not produce altered waste form. Add 10 points to the median score of 80 because a failed container is easily fixed.
• schedule for treatment of waste	80	Due to process simplicity, a schedule can be developed easily.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Process does not create emissions related to the waste stream. Process simply involves container welding.
• non-operational worker potential exposure	80	Simple welding process requiring minimal maintenance. Minimal personnel required for decommissioning.
• operational worker potential exposure	80	Exposure controlled by design and < average number of workers. Low potential for exposure.
• transportation potential exposure	60	No additional characterization needed. Add 10 points to the median score of 50 because waste can be handled readily following treatment.
<i>Regulatory Parameters</i>		
• need for variance	80	Process satisfies requirements of the "debris rule."
• ability to obtain a permit	40	Subtract 10 points from the median score of 50 because uncertainties surround attaining a permit related to the "debris rule" and the "containment rule."
• waste disposal	20	All waste will require disposal in HW/MW facilities.
<i>Public Acceptance</i>		
• public acceptance	40	Public concern should be limited due to the simplicity of the process. Subtract 10 points from the median score of 50 because the wasteform is not unalterably inert.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	20	Not a budget item, will require line item funding.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing technology.
• private sector involvement	0	Subtract 20 points from the median score of 20 because this is an existing technology.

IDOA Score: Technical 58 Total 72

Cost Estimate: INCLUDED WITH COST OF OPTION SR-W018-3

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges
Option Number: SR-W051-5
Facility: INEL/WERF Treatment Technology Incineration

Treatment Technology

INEL WERF Incinerator is a ram feed, stationary kiln incinerator. The facility is used to treat both solid and liquid waste. The system offgas is passes through a dry quench tower to remove contaminated prior to the release of the gas effluents. The facility cannot be used to treat wastes contaminated with chlorides. Chlorides react to create acids which, over time, will disintegrate the dry offgas system. The ash solids are removed and stabilized for disposal.

Pros

- Incineration will reduce the waste volume by a factor of 100 to 1.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The process has been demonstrated on similar waste types.
- 20% or less down time is anticipated when using this process.
- Process failure is not anticipated to result in the creation of a waste that cannot be treated.
- >80% of the treated waste will require disposal in LLW facility.

Cons

- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration at INEL is anticipated to drop will the additional treatment of offsite wastes.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	80	Incineration will reduce the waste volume by a factor of 100 to 1.
• secondary waste generation	50	An additional amount of ash waste, in the range of 10%, is generated, which can be handled by existing technologies.
• destruction removal and demobilization efficiency	50	Additional LDR treatments required for waste streams contaminated with non-organic contaminated (heavy metals).
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	50	The ash waste must be stabilized in a group matrix prior to shipment.
• final waste form	50	The ash waste after stabilization is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	The process has been demonstrated on similar waste types.
• availability	80	20% or less down time is anticipated when using this process.
• scalability	20	The process currently exists, so any expansion would require process modifications.
• remedial measures	80	Process failure is not anticipated to result in the creation of a waste that cannot be treated.

Waste Stream Number & Name: SR-W051 Spent Filter Cartridges

Option Number: SR-W051-5

Facility: INEL/WERF

Treatment Technology Incineration

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon state approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	50	Emissions from the facility could result during potential accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the state will call for a full Part B permit prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the States acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	80	>80% of the treated waste will require disposal in LLW facility.
<i>Public Acceptance</i>		
• public acceptance	20	Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration at INEL is anticipated to drop with the additional treatment of offsite wastes.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	50	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing commercial technology.
• private sector involvement	20	Facility is GOCO.

IDOA Score: Technical 47 Total 61

Waste Stream Number & Name: SR-W051 **Spent Filter Cartridges**
Option Number: SR-W051-5
Facility: INEL/WERF **Treatment Technology** Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (Inc. indirect)	\$ N/A	
2.5 Equipment (Inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 2
7.0 Transportation		\$ 18
8.0 Disposal		\$ 50
SUB COST FOR INCINERATOR MODULE		\$ 70
ESCALATION		1.06
TOTAL COST		\$ 74

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W051
Option Number: SR-W051-6
Facility: Containment Building

Spent Filter Cartridges
Treatment Technology Acid Leach

Option rejected during technical success factor evaluation. No further analysis performed.

Waste Stream Number & Name: SR-W051
Option Number: SR-W051-7
Facility: Vendor

Spent Filter Cartridges

Treatment Technology Plasma Hearth

Option rejected during technical success factor evaluation. No further analysis performed.

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Summary Page

Waste Stream Number & Name: SR-W052 **Cadmium Contaminated Glove Box Section**

Background Information

This waste stream was thought to contain a portion of a glovebox section that had been contaminated by the spill of a cadmium containing solution. Subsequent investigation disclosed that the waste stream did not contain a glovebox section. TCLP analysis of the remaining waste in the container, protective laboratory clothing, disclosed no cadmium or other metal contamination exceeding regulatory limits.

This waste stream will be deleted from the Mixed Waste Inventory Report and the Site Treatment Plan.

Waste stream eliminated.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W053 Rocky Flats Incinerator Ash

Background Information

This waste consists of a small volume of ash sent to SRS for research into plutonium recovery. Colorado courts declared the ash generated by Rocky Flats to be waste based on F-listed solvent waste processed in the incinerator. SRS then followed suit and placed the ash in a satellite accumulation area.

Volume

- Current volume through 09/30/93 = 0.1 m³.
- No future waste generation expected because waste originally came as sample material to run plutonium extraction studies. Once the Rocky Flats ash was declared a waste, plutonium studies were canceled.

Waste Stream Matrix

- Inorganic Sludge/Particulate

Waste Code

- D004A (TCLP As), D005A (TCLP Ba), D006A (TCLP Cd), D007A (TCLP Cr), D008A (TCLP Pb), D009A (TCLP Hg), D010A (TCLP Se), D011A (TCLP Ag), F001, F002, F005A (halogenated and nonhalogenated spent solvents)

LDR Treatment Standard

- Eventual management at WIPP through a no migration determination.

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level low. No analytical data, material is from another DOE site.
- It was declared a waste after SRS had the material in a vault and was handling it as Special Nuclear Material (SNM).

Radiological Characterization

- Transuranic – alpha emitter
- Waste is contact handled.
- Mixed transuranic waste (MTRU)

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Combustion	Material has already been incinerated.
ETF	Wastewater	ETF has no process to treat this waste.
M-Area	Vitrification	This waste contains TRU which is not allowed in M-Area.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page -- Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W053 Rocky Flats Incinerator Ash

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W053-1	Other DOE Site	Return to Rocky Flats	100	76	90	167	√
SR-W053-2	CIF	Ashcrete	88	55	68	2048	

Options Rejected Due To Low Technology Success Factor

- No options were rejected.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Rocky Flats Incinerator Ash waste stream is to return the waste to Rocky Flats for consolidation and treatment with similar wastes and treatment.

This option permits this minuscule volume of waste to be combined at Rocky Flats with hundreds of drums of this material, for which Rocky Flats will determine the preferred treatment.

This option is preferred because:

- It allows consistent treatment of all the MTRU ash waste generated at Rocky Flats.
- It eliminates duplication of research to determine treatment technology.
- It is cost-effective.

Treatability Study Requirements

This waste will not be treated at SRS; therefore, treatability studies will not be done here. Rocky Flats personnel will perform any treatability studies, if needed, to determine the disposal not only of the small quantity of waste returned by SRS, but also the vast amount currently in storage at Rocky Flats. No further studies involving this material are anticipated through FY2000.

Options Rejected During IDOA

Stabilization in Ashcrete at CIF

Stabilization in ashcrete at CIF was rejected because:

- Waste volume more than doubles.
- Handling this small volume waste at SRS will result in significant cost.

Waste Stream Number & Name: SR-W053 Rocky Flats Incinerator Ash
Option Number: SR-W053-1
Facility: Other DOE Site Treatment Technology Return to Rocky Flats

Treatment Cycle Flow Diagram:

Return of waste to generator (Rocky Flats) does not require a flow diagram.

Pros

- Treatment (if any) is at the discretion of Rocky Flats. This waste will be treated along with the existing large volume of incineration ash.
- Procedures exist that specify the requirements to return this material to the generator.
- Return of the ash to Rocky Flats and subsequent treatment (if any) will not increase the non-operational worker exposure.
- Return of the ash to Rocky Flats and subsequent treatment (if any) will not increase the operational worker exposure.
- Waste will not require further characterization for shipment.
- Does not require additional characterization to support transportation and limited number of waste transports required.
- No variance is required.
- No permits are required.
- No waste disposal will occur at SRS.
- Public will endorse a solution that eliminates a waste at SRS and does not materially increase waste amounts anywhere else.

Cons

- This approach will only work for wastes belonging to others currently held at SRS, of which this is the sole example.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	100	Add 20 points to the median score of 80 because SRS has no waste volume to dispose of.
• secondary waste generation	100	Treatment (if any) is at the discretion of Rocky Flats. Add 20 points to the median score of 80 because this waste will be treated along with the existing large volume of incineration ash, and <i>per se</i> generate no secondary waste.
• destruction removal and demobilization efficiency	100	Treatment (if any) is at the discretion of Rocky Flats. Add 20 points to the median score of 80 because this waste will be treated along with the existing large volume of incinerator ash. The destruction removal and demobilization efficiency will have to satisfy LDR treatment standards.
• flexibility	0	Subtract 20 points from the median score of 20 because this approach will only work for wastes belonging to others currently held at SRS, of which this is the sole example.
• ability to be shipped	80	Waste must meet shipping requirements to be returned to Rocky Flats.
• final waste form	100	This waste will be treated along with the existing large volume of incinerator ash. Add 20 points to the median score of 80 because the final waste form will have to satisfy the WAC of the ultimate disposal site.

Waste Stream Number & Name: SR-W053 Rocky Flats Incinerator Ash

Option Number: SR-W053-1

Facility: Other DOE Site

In-Depth Options Analysis Score Sheet

Treatment Technology Return to
Rocky Flats

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	80	Procedures exist that specify the requirements to return this material to the generator.
• availability	100	Add 20 points to the median score of 80 because availability is not a consideration for this option.
• scalability	100	Add 20 points to the median score of 80 because scalability is not a consideration for this option.
• remedial measures	80	Failure of Rocky Flats to accept the ash will necessitate stabilization by established technology.
• schedule for treatment of waste	50	Uncertainties exist regarding the schedule by which the ash can be returned.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	100	Ash is controlled at Rocky Flats to ensure that accident scenarios cause little or no release. Add 20 points to the median score of 80 because the volume of waste is minuscule.
• non-operational worker potential exposure	100	Add 20 points to the median score of 80 because return of the ash to Rocky Flats and subsequent treatment (if any) will not increase the operational worker exposure.
• operational worker potential exposure	100	Add 20 points to the median score of 80 because waste will not require further characterization for shipment.
• transportation potential exposure	100	Does not require additional characterization to support transportation. Add 20 points to the median score of 80 because limited number of waste transports required.
<i>Regulatory Parameters</i>		
• need for variance	100	Add 20 points to the median score of 80 because no variance is required.
• ability to obtain a permit	100	Add 20 points to the median score of 80 because no permits are required.
• waste disposal	100	Add 20 points to the median score of 80 because no waste disposal will occur at SRS.
<i>Public Acceptance</i>		
• public acceptance	80	Public will endorse a solution that eliminates a waste at SRS and does not materially increase waste amounts anywhere else.
<i>Cost Considerations</i>		
• life cycle cost	100	<250K.
• funding availability	50	Cost can be covered with operating budget with a slight one-time increase in allocation.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because does not apply to this option.
• private sector involvement	0	Subtract 20 points from the median score of 20 because does not apply to this option.

IDOA Score: Technical 76 Total 90

Waste Stream Number & Name: SR-W053 Rocky Flats Incinerator Ash
Option Number: SR-W053-1
Facility: Other DOE Site Treatment Technology Return to Rocky Flats
Cost Estimate Sheet

Waste Type: ☐ MLLW ☐ HLW ☒ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: Rocky Flats
Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 0	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 0	
1.3.2 Safety Assurance Documentation	\$ 0	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 150
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 0	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 0	
2.7 Contingency	\$ 0	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 15	
3.2 Annual Utilities	\$ 1	
3.3 Annual Materials	\$ 9	
3.4 Annual Maintenance	\$ 5	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 30	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 8
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 0	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 0
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 0
SUB COST FOR INCINERATOR MODULE		\$ 158
ESCALATION		1.06
TOTAL COST		\$ 167

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W053 Rocky Flats Incinerator Ash
Option Number: SR-W053-2
Facility: CIF Treatment Technology Ashcrete

Treatment Cycle Flow Diagram:

Pros

- No secondary waste produced by Ashcrete.
- The waste stream is expected to meet all applicable LDR standards after this treatment.
- Waste form meets shipping requirements without additional treatment.
- The waste form meets the expected WAC. Waste form suitable for disposal in the form it exits the process.
- Ashcrete is a current demonstrated technology and a proven technology.
- Process failure should not create a waste form that cannot be treated by existing technologies.
- Reasonably easy to schedule this waste stream assuming current startup schedule.
- The metals in this waste stream will be captured in the ashcrete. Very little emissions resulting in little or no emissions even during an accident.
- Well accepted waste form. No variance required.
- Line item is funded.

Cons

- Expected to increase volume by factor of 3.
- 100% of the final waste form will go to the HW/MW Vaults.
- Waste form is not as permanent as other forms of stabilization.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	10	Subtract 10 points from the median score of 20 because expected to increase volume by factor of 3.
• secondary waste generation	100	Add 20 points to the median score of 80 because no secondary waste produced by Ashcrete.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because the waste stream is expected to meet all applicable LDR standards after this treatment.
• flexibility	50	Waste handling of waste streams directly in ashcrete is an off-normal process, which lowers efficiency.
• ability to be shipped	80	Waste form meets shipping requirements without additional treatment.
• final waste form	100	The waste form meets the expected WAC. Add 20 points to the median score of 80 because waste form suitable for disposal in the form it exits the process.

Waste Stream Number & Name: SR-W053 Rocky Flats Incinerator Ash

Option Number: SR-W053-2

Facility: CIF

Treatment Technology Ashcrete

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	100	Ashcrete is a current demonstrated technology. Add 20 points to the median score of 80 because this is a proven technology.
• availability	50	Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load.
• scalability	50	Limited excess capacity exists because it is set by design.
• remedial measures	70	Presence of metals in the final waste form might require rework. Subtract 10 points from the median score of 80 because a process failure should not create a waste form that can not be treated by existing technologies.
• schedule for treatment of waste	80	Reasonably easy to schedule this waste stream assuming current startup schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	The metals in this waste stream will be captured in the ashcrete. Very little emissions resulting in little or no emissions even during an accident.
• non-operational worker potential exposure	70	Subtract 10 points from the median score of 80 because additional non-routine maintenance required.
• operational worker potential exposure	50	Increased operator handling due to this waste stream so the potential for exposure is increased.
• transportation potential exposure	50	Does not require additional characterization to support transportation and limited number of waste transports required.
<i>Regulatory Parameters</i>		
• need for variance	80	Well accepted waste form. No variance required.
• ability to obtain a permit	50	Modification required to facilities existing permit, but must demonstrate that it meets treatment standard.
• waste disposal	20	100% of the final waste form will go to the HW/MW Vaults. This may require disposal as TRU waste.
<i>Public Acceptance</i>		
• public acceptance	20	Mature and proven technology, however waste form is not as permanent as other forms of stabilization (i.e., vitrification).
<i>Cost Considerations</i>		
• life cycle cost	94	
• funding availability	80	Line item is funded.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because technology is being purchased.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing technology.

IDOA Score: Technical 55 Total 68

Waste Stream Number & Name: SR-W053 Rocky Flats Incinerator Ash
Option Number: SR-W053-2
Facility: CIF Treatment Technology Ashcrete
Cost Estimate Sheet

Waste Type: ☐ MLLW ☐ HLW ☒ M-TRU
☒ alpha ☐ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 0	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 0	
1.3.2 Safety Assurance Documentation	\$ 0	
1.3.3 Permitting	\$ 1500	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 1650
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 0	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 0	
2.7 Contingency	\$ 0	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 30	
3.2 Annual Utilities	\$ 1	
3.3 Annual Materials	\$ 18	
3.4 Annual Maintenance	\$ 11	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 60	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 15
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 0	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 0
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 0
SUB COST FOR INCINERATOR MODULE		\$ 1665
ESCALATION		1.23
TOTAL COST		\$ 2048

If above numbers do not appear to add correctly, it is the result of computer rounding.

Summary Page

Waste Stream Number & Name: SR-W054 Enriched Uranium Contaminated with Lead

Background Information

An acidified analytical solution generated by the laboratory performing a total uranium analysis by Jones reduction. The stream was located in 320-M laboratory satellite accumulation area, was moved and consolidated on June 28, 1994 with waste stream SR-W037, M-Area Nickel Plating Line Sludge. This consolidation was prompted by the DOE commitment to de-inventory fissile material in the 320-M laboratory by June 30, 1994. SR-W054 no longer exists as a separate waste stream.

This waste stream will be deleted from the Mixed Waste Inventory Report and the Site Treatment Plan.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent
Contaminated Wipes

Background Information

This waste is sitewide operations generated job waste, including radiologically contaminated plastic huts, protective clothing, contaminated metal tools, glass, paper and cardboard which is suspected to have been mixed with solvent contaminated wipes. Job waste has been declared mixed waste due to the mixture rule. SRS has modified procedures and practices regarding solvent contaminated wiper generation and management to eliminate or substantially reduce this type of waste.

Volume

- Current volume through 09/30/93 is 951 m³.
- No future waste generation expected due to the solvent rag minimization program.

Waste Stream Matrix

- Organic Debris

Waste Code

- F001, F002, F003, F005A (halogenated and nonhalogenated spent solvents)

LDR Treatment Standard

- Concentration based standard = 0.75 mg/l-170 mg/kg except for 2-Ethoxyethanol, 2-Nitropropane-Incineration = specified technology
- Alternate debris technology may be applied

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium based on the use of process knowledge to characterize waste. Also, other waste in the waste stream may not actually be contaminated with solvents but are characterized as such, due to the mixture rule.

Radiological Characterization

- Beta/gamma emitter
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
ETF	Wastewater	ETF has no process to treat this waste.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
LETF	Wastewater	LETF has no process to treat this waste.
M-Area	Vitrification	This waste has too large a volume than M-Area can handle effectively.
Tritium	Macro-encapsulation	Cannot have fission products in tritium.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page -- Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent Contaminated Wipes

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W055-1	CIF	Incineration	94	62	71	11729	√
SR-W055-2	INEL/WEDF	Stabilization	*	51	53	29000	
SR-W055-3	INEL/WERF	Incineration	*	45	47	29000	
SR-W055-4	INEL/IWPF	Incineration	*	35	37	29000	

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

- No options were rejected.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Job Waste Containing Solvent Contaminated Wipes waste stream is Incineration in the Consolidated Incineration Facility (CIF).

This option treats the constituents of concern, listed organics, by converting the combustible fraction to carbon dioxide, water, and salt, and stabilizing residuals with cement.

This option is preferred because:

- Waste volume will be reduced by a factor of at least 2.
- Final waste form will meet LDR standards.
- Incineration and ash stabilization are demonstrated technologies.
- CIF is currently under construction.
- Residual solids are stabilized with cement.
- It is cost-effective.

Options Rejected During IDOA

Stabilization at INEL/WEDF

Stabilization at INEL/WEDF (encapsulating the waste with a grout matrix) was rejected because:

- Large volume waste streams are designated to be treated onsite.
- Rejected option is less cost effective than the preferred option.
- Waste volume will more than double.
- Existing process will have to be expanded to handle this waste.
- Combustible material will have to be shipped to the treatment facility.

Incineration at INEL/WERF

Incineration at INEL/WERF was rejected because:

- Large volume waste streams are designated to be treated onsite.
- Cost of pretreatment (shredding and packaging) will not be avoided.
- Rejected option is less cost effective than the preferred option.
- Offsite incineration offers neither technological nor environmental advantage over the preferred option.

Incineration at INEL/IWPF

Incineration at INEL/IWPF was rejected because:

- INEL/IWPF is a planned, but not approved facility. DOE guidance forbids consideration of such facilities.
- Large volume waste streams are designated to be treated onsite.
- Rejected option is less cost effective than the preferred option.

Waste Stream Number & Name: SR-W055
Option Number: SR-W055-1
Facility: CIF

Job Waste Containing Solvent
Contaminated Wipes
Treatment Technology Incineration

Treatment Cycle Flow Diagram:

Pros

- Expect at least 2:1 reduction.
- The waste stream is expected to meet all applicable LDR standards.
- Incinerator designed for a wide range of wastes with some operational limitations.
- Waste does not require additional treatment to meet shipping requirements.
- The waste forms expected to meet the disposal WAC in the form it exits the facility.
- Incineration is a current demonstrated technology.
- Process failures will not result in a waste form that cannot be treated by existing technologies.
- Reasonably easy to schedule this waste stream assuming current startup schedule.
- Most of the additional metals in this waste stream will be captured in the ashcrete resulting in little or no emissions from the facility even during most accidents.
- No additional non-operational workers are required.
- No additional operational workers will be required.
- All processes are in full compliance with existing regulations and no variances are required.
- Line item is funded.

Cons

- 100% of the final waste form will go to HW/MW Disposal.
- The public has significant concerns about incineration and publicly expressed concerns about the safety of incinerators.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	70	Subtract 10 points from the median score of 80 because expect at least 2:1 reduction.
• secondary waste generation	40	Subtract 10 points from the median score of 50 because significant volume of secondary waste due to non-combustible sludge.

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent
Option Number: SR-W055-1 Contaminated Wipes
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because the waste stream is expected to meet all applicable LDR standards.
• flexibility	80	Incinerator designed for a wide range of wastes with some operational limitations.
• ability to be shipped	80	Waste does not require additional treatment to meet shipping requirements.
• final waste form	100	Add 20 points to the median score of 80 because the waste forms expected to meet the disposal WAC in the form it exits the facility.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because incineration is a current demonstrated technology.
• availability	50	Incinerator availability for solids is 50%. Normal maintenance requirements apply.
• scalability	50	Capacity is set by design, but the facility can accept a wide range of inputs.
• remedial measures	70	The presence of metals in the secondary wastes might require rework. Subtract 10 points from the median score of 80 because process failures will not result in a waste form that cannot be treated by existing technologies.
• schedule for treatment of waste	80	Reasonably easy to schedule this waste stream assuming current startup schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Most of the additional metals in this waste stream will be captured in the ashcrete resulting in little or no emissions from the facility even during most accidents.
• non-operational worker potential exposure	70	No additional non-operational workers are required. Subtract 10 points from the median score of 80 because additional non routine maintenance will be required.
• operational worker potential exposure	80	No impact because no additional operational workers will be required.
• transportation potential exposure	60	Limited transportation will be required. Add 10 points to the median score of 50 because no additional characterization will be required.
<i>Regulatory Parameters</i>		
• need for variance	80	All processes are in full compliance with existing regulations and no variances are required.
• ability to obtain a permit	100	Add 20 points to the median score of 80 because this waste is part of the basis for permitting.
• waste disposal	20	100% of the final waste form will go to HW/MW Disposal.
<i>Public Acceptance</i>		
• public acceptance	20	Incineration has limited acceptance. Public has expressed concerns about the safety of incinerators.
<i>Cost Considerations</i>		
• life cycle cost	66	

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent
Option Number: SR-W055-1 Contaminated Wipes
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• funding availability	80	Line item is funded.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because has applicability at all DOE complex sites. Technology is being purchased.
• private sector involvement	100	Add 20 points to the median score of 80 because little or no private sector involvement is anticipated because this is an existing technology.

IDOA Score: Technical 62 Total 71

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent
Option Number: SR-W055-1 Contaminated Wipes
Facility: CIF Treatment Technology Incineration
Cost Estimate Sheet

INCLUDES COST OF OPTION SR-W056-1

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 65	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 261	
1.3.2 Safety Assurance Documentation	\$ 65	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 0	
1.3.5 Project Management	\$ 45	
TOTAL PRE-OPERATIONS		\$ 436
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 286	
2.2 Inspection	\$ 82	
2.3 Project Management	\$ 127	
2.4 Building Construction (inc. indirect)	\$ 1000	
2.5 Equipment (inc. indirect)	\$ 300	
2.6 Construction Management	\$ 91	
2.7 Contingency	\$ 676	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 2562
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 713	
3.2 Annual Utilities	\$ 29	
3.3 Annual Materials	\$ 428	
3.4 Annual Maintenance	\$ 257	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 1425	
X NUMBER OF YEARS OF OPERATION	2.00	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 2850
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 1040	
4.2 Closure, Post-Closure, Monitoring	\$ 100	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1140
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 2000
SUB COST FOR INCINERATOR MODULE		\$ 8988
ESCALATION		1.305
TOTAL COST		\$ 11729

If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent
Option Number: SR-W055-2 Contaminated Wipes
Facility: INEL/WEDF Treatment Technology Stabilization

Treatment Technology

The INEL WEDF Stabilization process provides treatments for aqueous and organic liquids and debris. The process stabilizes waste in a grout matrix to reduce leachability.

Pros

- Little secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	Little secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.

Waste Stream Number & Name: SR-W055
Option Number: SR-W055-2
Facility: INEL/WEDF
In-Depth Options Analysis Score Sheet

Job Waste Containing Solvent
Contaminated Wipes
Treatment Technology Stabilization

Attribute	Score	Discussion/Notes
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the States acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	17	
• funding availability	20	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 53

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent
Option Number: SR-W055-2 Contaminated Wipes
Facility: INEL/WEDF Treatment Technology Stabilization
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 26,000
7.0 Transportation		\$ 352
8.0 Disposal		\$ 1,000
SUB COST FOR STABILIZATION MODULE		\$ 27,352
ESCALATION		1.06
TOTAL COST		\$ 29,000

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent
Option Number: SR-W055-3 Contaminated Wipes
Facility: INEL/WERF Treatment Technology Incineration

Treatment Technology

INEL WERF Incinerator is a ram feed, stationary kiln incinerator. The facility is used to treat both solid and liquid waste. The system offgas is passes through a dry quench tower to remove contaminated prior to the release of the gas effluents. The facility cannot be used to treat wastes contaminated with chlorides. Chlorides react to create acids which, over time, will disintegrate the dry offgas system. The ash solids are removed and stabilized for disposal.

Pros

- Incineration will reduce the waste volume by a factor of 100 to 1.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The process has been demonstrated on similar waste types.
- 20% or less down time is anticipated when using this process.
- Process failure is not anticipated to result in the creation of a waste that cannot be treated.

Cons

- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The 80% of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
- Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration at INEL is anticipated to drop will the additional treatment of offsite wastes.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	80	Incineration will reduce the waste volume by a factor of 100 to 1.
• secondary waste generation	40	Subtract 10 points from the median score of 50 because significant volume of secondary waste due to non-combustible sludge.
• destruction removal and demobilization efficiency	50	Additional LDR treatments may be required for waste streams contaminated with non-organic materials.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	50	The ash waste must be stabilized in a group matrix prior to shipment.
• final waste form	50	The ash waste after stabilization is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	The process has been demonstrated on similar waste types.
• availability	80	20% or less down time is anticipated when using this process.
• scalability	20	The process currently exists, so any expansion would require process modifications.

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent
Option Number: SR-W055-3 Contaminated Wipes
Facility: INEL/WERF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• remedial measures	80	Process failure is not anticipated to result in the creation of a waste that cannot be treated.
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	50	Emissions from the facility could result during potential accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the States acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The 80% of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	20	Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration at INEL is anticipated to drop with the additional treatment of offsite wastes.
<i>Cost Considerations</i>		
• life cycle cost	17	
• funding availability	50	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing commercial technology.
• private sector involvement	20	Facility is GOCO.

IDOA Score: Technical 45 Total 47

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent
Option Number: SR-W055-3 Contaminated Wipes
Facility: INEL/WERF Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 26,000
7.0 Transportation		\$ 352
8.0 Disposal		\$ 1,000
SUB COST FOR INCINERATION MODULE		\$ 27,352
ESCALATION		1.06
TOTAL COST		\$ 29,000

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent
Option Number: SR-W055-4 Contaminated Wipes
Facility: INEL/IWPF Treatment Technology Incineration

Treatment Technology

INEL IWPF incinerator is in the preliminary design phase. The type of kiln and offgas system have not yet been determined.

Pros

- Incineration will reduce the waste volume by more than 100 to 1.
- The facility will treat waste streams similar in composition to those assumed in the design basis without modification.
- Any ash waste generated, after stabilization, is anticipated to meet the SRS disposal WAC.
- Process failure is not anticipated to result in the creation of a waste that cannot be treated.

Cons

- The facility is in preliminary design phase, uncertain of facility design and secondary waste streams. An ash waste stream and some blowdown type wastes are anticipated.
- The process is currently in the preliminary design phase, final incinerator type has been selected.
- Uncertainties surrounding the design prevent an accurate estimation of availability.
- A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications. In addition facility operation is contingent upon the receipt of DOE funding.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The process will require Part B Permit Application approval from the state. State approval for treatment of offsite waste may be difficult.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
- Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration is anticipated to drop with the additional treatment of offsite wastes.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	80	Incineration will reduce the waste volume by more than 100 to 1.
• secondary waste generation	20	The facility is in preliminary design phase, uncertain of facility design and secondary waste streams. An ash waste stream and some blowdown type wastes are anticipated.
• destruction removal and demobilization efficiency	50	Additional LDR treatment may be required for waste streams contaminated with non-organic materials.
• flexibility	80	The facility will treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	50	The ash waste, when generated, must be stabilized in a group matrix prior to shipment.
• final waste form	80	Any ash waste generated, after stabilization, is anticipated to meet the SRS disposal WAC.

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent
Option Number: SR-W055-4 Contaminated Wipes
Facility: INEL/IWPF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Engineering Parameters</i>		
• system implementability	20	The process is currently in the preliminary design phase, final incinerator type has been selected.
• availability	20	Uncertainties surrounding the design prevent an accurate estimation of availability.
• scalability	50	The facility is currently in the preliminary design phase. Any modification required for unique waste streams could be incorporated in to the facility design.
• remedial measures	80	Process failure is not anticipated to result in the creation of a waste that cannot be treated.
• schedule for treatment of waste	20	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications. In addition facility operation is contingent upon the receipt of DOE funding.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	50	Emissions from the planned facility could result during potential accident scenarios.
• non-operational worker potential exposure	50	The facility is in the early design phase, so construction of the facility will be required.
• operational worker potential exposure	50	Personnel exposure is anticipated to be average for operations of this type.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	20	The process will require Part B Permit application approval from the state. State approval for treatment of offsite waste may be difficult.
• ability to obtain a permit	50	Permitting process is well defined, however, the state's acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	20	Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration is anticipated to drop will the additional treatment of offsite wastes.
<i>Cost Considerations</i>		
• life cycle cost	17	
• funding availability	50	Funding for treatment cost can be provide using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%. (Line item funding is being pursued by the facility contractor).

Waste Stream Number & Name: SR-W055
Option Number: SR-W055-4
Facility: INEL/IWPF
In-Depth Options Analysis Score Sheet

Job Waste Containing Solvent
Contaminated Wipes
Treatment Technology Incineration

Attribute	Score	Discussion/Notes
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing commercial technology.
• private sector involvement	20	Facility is GOCO.

IDOA Score: Technical 35 Total 37

Waste Stream Number & Name: SR-W055 Job Waste Containing Solvent
Option Number: SR-W055-4 Contaminated Wipes
Facility: INEL/IWPPF Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☐ Existing ☒ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 26,000
7.0 Transportation		\$ 352
8.0 Disposal		\$ 1,000
SUB COST FOR INCINERATION MODULE		\$ 27,352
ESCALATION		1.06
TOTAL COST		\$ 29,000

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W056 **Job Waste with Enriched Uranium and Solvent Applicators**

Background Information

This waste stream is job wastes such as plastic huts, protective clothing, contaminated metal tools, glass bottles, paper, etc., that were declared hazardous due to the likelihood of being mixed with solvent contaminated rags. The waste is contaminated with enriched uranium from the Naval Fuels (NF) Facility, which is no longer operational.

Volume

- Current volume through 09/30/93 is 260 m³.
- No future waste generation expected because the NF manufacturing process which generated this waste is no longer operational.

Waste Stream Composition

- Organic debris

Waste Code

- F001, F002, F003, F005A (halogenated and nonhalogenated spent solvents)

LDR Treatment Standard

- Concentration based standard = 0.75 mg/l-170 mg/kg except for 2-Ethoxyethanol, 2-Nitropropane-Incineration
- Alternative debris technology may be applied

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is medium based on the use of process knowledge to characterize waste and the use of the mixture rule, declaring low level job control waste mixed if it was suspected that solvent wipes could have been placed in the box or drum.

Radiological Characterization

- The 90 cubic foot boxes contain 146-246 grams of U²³⁵.
- The 55 gallon drums contain 0-115 grams U²³⁵.
- This waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
ETF	Wastewater	ETF has no process to treat this waste.
Lab.	Lab scale process flowsheet	Volume of waste too great to handle with laboratory-scale equipment.
LETF	Wastewater	LETF has no process for treating this waste.
M-Area	Vitrification	This waste contains too much U ²³⁵ to have the volume diminished as vitrification would without causing criticality concerns.
Tritium	Macroencapsulation	Cannot have fission products in tritium.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page – Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W056 Job Waste with Enriched Uranium and Solvent Applicators

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF	IDOA Scores		COST (x 1000)	PO
			Score	Tech.	Total		
SR-W056-1	CIF	Incineration	94	62	76	SR-W055-1	√
SR-W056-2	INEL/WEDF	Stabilization	*	51	64	1734	
SR-W056-3	INEL/WERF	Incineration	*	45	58	1734	

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

- No options were rejected.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Job Waste with Enriched Uranium and Solvent Applicators is Incineration in the Consolidated Incineration Facility (CIF).

This option treats the constituents of concern, listed organics and radionuclides, by converting the combustible fraction to carbon dioxide, water, and salt, and stabilizing residuals with cement.

This option is preferred because:

- Waste volume will be reduced by a factor of at least 2.
- Final waste form will meet LDR standards.
- Incineration and ash stabilization are demonstrated technologies. CIF is currently under construction.
- Residual solids are stabilized with cement.
- It is cost-effective.

Options Rejected During IDOA

Stabilization at INEL/WEDF

Stabilization at INEL/WEDF (encapsulating the waste with a grout matrix) was rejected because:

- Large volume waste streams are designated to be treated onsite.
- Rejected option is less cost effective than the preferred option.
- Waste volume will more than double.
- Existing process will have to be expanded to handle this waste.
- Stabilization does not treat the hazardous component.

Incineration at INEL/WERF

Incineration at INEL/WERF was rejected because:

- Waste contains chlorides, which upon incineration will produce acids causing grave damage WERF's offgas system.
- Large volume waste streams are designated to be treated onsite.

Waste Stream Number & Name: SR-W056
Option Number: SR-W056-1
Facility: CIF

Job Waste with Enriched Uranium and
Solvent Applicators
Treatment Technology Incineration

Treatment Cycle Flow Diagram:

Pros

- Expect at least 2:1 reduction.
- The waste stream is expected to meet all applicable LDR standards after treatment.
- Incinerator designed for a wide range of wastes with some operational limitations.
- Waste form meets shipping requirements without additional treatment.
- The waste forms expected to meet the disposal WAC in the form it exits the facility.
- Incineration is a current demonstrated technology.
- Can handle this quantity of waste.
- Process failures will not result in a waste form that cannot be treated by existing technologies.
- Reasonably easy to schedule this waste stream assuming current startup schedule.
- Most of the additional metals in this waste stream will be captured in the ashcrete resulting in little or no emissions from the facility even during most accidents.
- Expect average numbers compared to industrial complex construction and operation. No additional non-operational workers are required.
- No impact due to this waste stream because no additional operational workers are required and no increased potential for exposure.
- All processes are in full compliance with existing regulations, no facility modifications are required, no variances are required.
- This waste is part of the basis for permitting.
- Line item is funded.

Cons

- 100% of the final waste form will go to the HW/MW Vaults.
- The public has expressed significant concerns about incineration and publicly questioned the safety of incineration.

Waste Stream Number & Name: SR-W056 Job Waste with Enriched Uranium and
Option Number: SR-W056-1 Solvent Applicators
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	70	Subtract 10 points from the median score of 80 because expect at least 2:1 reduction.
• secondary waste generation	40	Subtract 10 points from the median score of 50 because significant volume of secondary waste due to non-combustible sludge.
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because the waste stream is expected to meet all applicable LDR standards after treatment.
• flexibility	80	Incinerator designed for a wide range of wastes with some operational limitations.
• ability to be shipped	80	Waste form meets shipping requirements without additional treatment.
• final waste form	100	Add 20 points to the median score of 80 because the waste forms expected to meet the disposal WAC in the form it exits the facility.
<i>Engineering Parameters</i>		
• system implementability	100	Add 20 points to the median score of 80 because incineration is a current demonstrated technology.
• availability	50	Incinerator availability for solids is 50%. Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load.
• scalability	50	Can handle this quantity of waste. Excess capacity exists.
• remedial measures	70	The presence of metals in the secondary wastes might require rework. Subtract 10 points from the median score of 80 because process failures will not result in a waste form that cannot be treated by existing technologies.
• schedule for treatment of waste	80	Reasonably easy to schedule this waste steam assuming current startup schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Most of the additional metals in this waste stream will be captured in the ashcrete resulting in little or no emissions from the facility even during most accidents.
• non-operational worker potential exposure	70	Expect average numbers compared to industrial complex construction and operation. Subtract 10 points from the median score of 80 because no additional non-operational workers are required but additional non routine maintenance will be required.
• operational worker potential exposure	80	No impact due to this waste stream because no additional operational workers are required and no increased potential for exposure.
• transportation potential exposure	60	Limited transportation will be required. Add 10 points to the median score of 50 because no additional characterization will be required.

Waste Stream Number & Name: SR-W056 Job Waste with Enriched Uranium and
Option Number: SR-W056-1 Solvent Applicators
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Regulatory Parameters</i>		
• need for variance	80	All processes are in full compliance with existing regulations and no variances are required.
• ability to obtain a permit	80	This waste is part of the basis for permitting.
• waste disposal	20	100% of the final waste form will go to the HW/MW Vaults.
<i>Public Acceptance</i>		
• public acceptance	20	The public has expressed significant concerns about incineration and publicly questioned the safety of incineration.
<i>Cost Considerations</i>		
• life cycle cost	100	
• funding availability	80	Line item is funded.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because technology is being purchased.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing technology.

IDOA Score: Technical 62 Total 76

Cost Estimate: INCLUDED WITH COSTS OF OPTION SR-W055-1

Waste Stream Number & Name: SR-W056 Job Waste with Enriched Uranium and
Option Number: SR-W056-2 Solvent Applicators
Facility: INEL/WEDF Treatment Technology Stabilization

Treatment Technology

The INEL WEDF Stabilization process provides treatments for aqueous and organic liquids and debris. The process stabilizes waste in a grout matrix to reduce leachability.

Pros

- Little secondary waste streams are generated.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The stabilized waste could be shipped without additional treatment.
- Final waste form is anticipated to meet the SRS disposal WAC.
- Stabilization has been demonstrated at the facility.
- The facility is anticipated to have minimal down time.
- Process failure is not anticipated to create a waste stream that cannot be treated.
- Few emissions for the facility are anticipated during normal operation and most accident scenarios.
- The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.

Cons

- Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	20	Stabilization will increase the overall waste volume by a factor of 2 or more after processing.
• secondary waste generation	80	Little secondary waste streams are generated.
• destruction removal and demobilization efficiency	50	Additional treatment for some waste streams may be required prior to stabilization to ensure LDR standards are met.
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	80	The stabilized waste could be shipped without additional treatment.
• final waste form	80	Final waste form is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Stabilization has been demonstrated at the facility.
• availability	80	The facility is anticipated to have minimal down time.
• scalability	20	The process currently exists, so any expansion would require process modifications.
• remedial measures	80	Process failure is not anticipated to create a waste stream that cannot be treated.

Waste Stream Number & Name: SR-W056 Job Waste with Enriched Uranium and
Option Number: SR-W056-2 Solvent Applicators
Facility: INEL/WEDF Treatment Technology Stabilization
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon state approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Few emissions for the facility are anticipated during normal operation and most accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the States acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The majority of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	50	Public acceptance for stabilization is positive; however, the treatment of offsite waste is anticipated to reduce the overall public acceptance of this process.
<i>Cost Considerations</i>		
• life cycle cost	95	
• funding availability	50	Funding for treatment cost can be provide using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	80	The facility could potentially be used to treat numerous waste streams throughout the DOE Complex.
• private sector involvement	20	Facility is a GOCO.

IDOA Score: Technical 51 Total 64

Waste Stream Number & Name: SR-W056 Job Waste with Enriched Uranium and
Option Number: SR-W056-2 Solvent Applicators
Facility: INEL/WEDF Treatment Technology Stabilization
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 784
7.0 Transportation		\$ 352
8.0 Disposal		\$ 500
SUB COST FOR STABILIZATION MODULE		\$ 1,636
ESCALATION		1.06
TOTAL COST		\$ 1,734

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

Waste Stream Number & Name: SR-W056 Job Waste with Enriched Uranium and
Option Number: SR-W056-3 Solvent Applicators
Facility: INEL/WERF Treatment Technology Incineration

Treatment Technology

INEL WERF Incinerator is a ram feed, stationary kiln incinerator. The facility is used to treat both solid and liquid waste. The system offgas is passes through a dry quench tower to remove contaminated prior to the release of the gas effluents. The facility cannot be used to treat wastes contaminated with chlorides. Chlorides react to create acids which, over time, will disintegrate the dry offgas system. The ash solids are removed and stabilized for disposal.

Pros

- Incineration will reduce the waste volume by a factor of 100 to 1.
- The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
- The process has been demonstrated on similar waste types.
- 20 % or less down time is anticipated when using this process.
- Process failure is not anticipated to result in the creation of a waste that cannot be treated.

Cons

- The process currently exists, so any expansion would require process modifications.
- Waste characterization will be required for any waste streams returned to SRS for disposal.
- The 80% of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
- Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration at INEL is anticipated to drop will the additional treatment of offsite wastes.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	80	Incineration will reduce the waste volume by a factor of 100 to 1.
• secondary waste generation	50	An additional amount of ash waste, in the range of 10%, is generated, which can bc handled by existing technologies
• destruction removal and demobilization efficiency	50	Additional LDR treatments required for waste streams contaminated with non-organic contaminated (heavy metals).
• flexibility	80	The facility can treat waste streams similar in composition to those assumed in the design basis without modification.
• ability to be shipped	50	The ash waste must be stabilized in a group matrix prior to shipment.
• final waste form	50	The ash waste after stabilization is anticipated to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	The process has been demonstrated on similar waste types.
• availability	80	20% or less down time is anticipated when using this process.
• scalability	20	The process currently exists, so any expansion would require process modifications.

Waste Stream Number & Name: SR-W056 Job Waste with Enriched Uranium and
Option Number: SR-W056-3 Solvent Applicators
Facility: INEL/WERF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• remedial measures	80	Process failure is not anticipated to result in the creation of a waste that cannot be treated.
• schedule for treatment of waste	50	A schedule for waste treatment can be provided; however, acceptance of SRS waste will be contingent upon State approved permit modifications.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	50	Emissions from the facility could result during potential accident scenarios.
• non-operational worker potential exposure	50	Processing this material will not increase the exposure to non-operational personnel.
• operational worker potential exposure	50	Personnel exposure is average for operations of this type. Processing this material will not increase the exposure to operational personnel.
• transportation potential exposure	20	Waste characterization will be required for any waste streams returned to SRS for disposal.
<i>Regulatory Parameters</i>		
• need for variance	50	Process is currently permitted under interim status. Acceptance of offsite waste will require submission of a permit modification. It is anticipated that the State will call for a full Part B Permit Application prior to acceptance of offsite wastes.
• ability to obtain a permit	50	Permitting process is well defined, however, the States acceptance of offsite waste treatment is unknown. Approval may be difficult.
• waste disposal	20	The 80% of the treated waste will be classified as mixed waste which will require disposal in a HW/MW facility.
<i>Public Acceptance</i>		
• public acceptance	20	Currently stakeholder acceptance of incineration is perceived as low. Public approval of incineration at INEL is anticipated to drop with the additional treatment of offsite wastes.
<i>Cost Considerations</i>		
• life cycle cost	95	
• funding availability	50	Funding for treatment cost can be provided using the operating budget, however the additional costs may result in an increase in the budget in excess of 10%.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because this is an existing commercial technology.
• private sector involvement	20	Facility is GOCO.

IDOA Score: Technical 45 Total 58

Waste Stream Number & Name: SR-W056 Job Waste with Enriched Uranium and
Option Number: SR-W056-3 Solvent Applicators
Facility: INEL/WERF Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: INEL
Module Status: ☒ Existing ☐ New ☐ Small generator ☒ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ N/A	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ N/A	
1.3.2 Safety Assurance Documentation	\$ N/A	
1.3.3 Permitting	\$ N/A	
1.3.4 Preparation for Operations	\$ N/A	
1.3.5 Project Management	\$ N/A	
TOTAL PRE-OPERATIONS		\$ N/A
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ N/A	
2.2 Inspection	\$ N/A	
2.3 Project Management	\$ N/A	
2.4 Building Construction (inc. indirect)	\$ N/A	
2.5 Equipment (inc. indirect)	\$ N/A	
2.6 Construction Management	\$ N/A	
2.7 Contingency	\$ N/A	
TOTAL FACILITY CONSTRUCTION COSTS		\$ N/A
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ N/A	
3.2 Annual Utilities	\$ N/A	
3.3 Annual Materials	\$ N/A	
3.4 Annual Maintenance	\$ N/A	
3.5 Annual Contingency	\$ N/A	
TOTAL ANNUAL O & M	\$ N/A	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ N/A
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ N/A	
4.2 Closure, Post-Closure, Monitoring	\$ N/A	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ N/A
5.0 Contractor Services		
5.1 Commercial Treatment/Disposal	\$ N/A	
5.2 Mobile Treatment	\$ N/A	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$ 784
7.0 Transportation		\$ 352
8.0 Disposal		\$ 500
SUB COST FOR INCINERATION MODULE		\$ 1,636
ESCALATION		1.06
TOTAL COST		\$ 1,734

Note: Per DOE directions this cost carries no overhead burden or capital costs.
If above numbers do not appear to add correctly, it is the result of computer rounding.

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Summary Page

Waste Stream Number & Name: SR-W057 D-Tested Neutron Generators

Background Information

Material shipped to SRS from the Pantex site. D-tested (destructively tested) neutron generators were mixed with non destructively tested generators in error. Destructively tested material has been returned to Pantex.

This waste stream has been returned to the site where it was generated.

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Summary Page – Initial Screening

Waste Stream Number & Name: SR-W058 Mixed Sludge Waste with Mercury from
DWPF Treatability Studies

Background Information

This waste stream consists of high-level waste supernate, sludge, and salt samples from the tank farm with mercury contamination, generated during DWPF treatability studies. The waste mercury sludge which has dried and caked onto eight centrifuge tubes and a glass bottle. The waste is stored in a satellite accumulation area metal can in a shielded cell at SRTC. The waste stream was reported incorrectly as mixed low-level waste in the final Mixed Waste Inventory Report rather than high-level waste. Because of the very small volume of this waste stream (actual volume – 0.0003 m³), SRTC would like to explore options to treat the waste by developing a process flow sheet and treating the waste as a 90-day generator. The possible alternatives include acid dissolution followed by mercury separation as a pretreatment with aqueous waste eventually going to the High-Level Waste Tank Farm and processed in the DWPF or vitrification directly in the SRTC test melter. If high level vitrification is not the preferred process flow sheet for this small quantity of waste, SRS will need to request DHEC to approve the regulatory discretion of an alternative treatment.

Volume

- Current volume through 09/30/93 is 0.1 m³.
- No future waste generation expected; one time generation.

Waste Stream Composition

- Organic debris – glass

Waste Code

- D009F – (high-level waste Hg) nonwastewater

LDR Treatment Standard

- Specified technology = Vitrification of high level mixed radioactive wastes

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high.

Radiological Characterization

- Beta/gamma emitter Cs¹³⁷, Eu¹⁵⁴ and Sr⁹⁰.
- Activity level > 10,000 nCi/g
- Waste is remote handled.
- High level waste

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Summary Page -- Initial Screening

Waste Stream Number & Name: SR-W059 Tetrabutyl Titanate (TBT)

Background Information

This organic liquid was used as a catalyst in the Beta/Gamma Incinerator in H-Area. When the incinerator was shut down, excess material could not be used elsewhere onsite or returned to the vendor. It was declared a hazardous waste due to TBT degrading to ignitable butanol. Prior to shipping the waste for offsite treatment, all of the drums underwent radiological screening in which four drums showed detectable levels of tritium (H^3) in their analysis. These four drums were withheld from the rest and declare mixed waste.

Volume

- Current volume through 09/30/93 is 0.8 m³.
- No future waste generation expected because excess material is from the Beta/Gamma Incinerator which is no longer operating.

Waste Stream Composition

- Organic liquid

Waste Code

- D001A (ignitable, high TOC)

LDR Treatment Standard

- Specified technology = Fuel Substitution, Recovery of Organics, or Incineration

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level is high since this is technical grade tetrabutyl titanate which degrades to butanol (ignitable).

Radiological Characterization

- Typical activity of tritium is 1.5 nCi/g.
- Tritium detection is suspect (may be a false detection) but the site is handling it as mixed waste until additional analysis may be scheduled to verify first analysis.
- Waste is contact handled.
- Mixed low-level waste

Initial Screening

The initial screening identified inappropriate treatment options. These options appear in the Initial Rejections table.

Initial Rejections

Treatment Facility	Treatment Technology	Reasons for Rejection
CIF	Ashcrete	Ashcrete does not remove the characteristic organics. Resulting waste form would not meet LDR requirements.
ETF	Wastewater	ETF has no process to treat solvents.
LETF	Wastewater	LETF has no process to treat this waste.
M-Area	Vitrification	Vitrifier is not an incinerator. It is not designed to burn an organic stream.
Z-Area	Stabilization	Z-Area can treat only those wastes that come by pipeline from Tank 50, and meet strict waste acceptance criteria. The Z-Area process lacks flexibility to treat and dispose of a variety of waste streams.

Summary Page -- Technology Success Factor (TSF) & In-Depth Options Analysis (IDOA)

Waste Stream Number & Name: SR-W059 Tetrabutyl Titanate (TBT)

Feasible Options

Option No.	Treatment Facility	Treatment Technology	TSF Score	IDOA Scores		COST (x 1000)	PO
				Tech.	Total		
SR-W059-1	CIF	Incineration	94	66	79	207	√
SR-W059-2	Oak Ridge	Incineration	*	48	61	184	
SR-W059-3	Cont. Bldg.	Air Sparge	26				

* Existing facility. No initial screening with TSF required.

Options Rejected Due To Low Technology Success Factor

Air Sparge in Containment Building

Air sparge in containment building was rejected because:

- Although air sparging is a common chemical processing technique, its use on this waste stream has been demonstrated at laboratory scale only. Hence, $P_m=0.7$.
- Scale-up to a full-size processing unit contributes to the overall complexity. Hence, $P_c=0.7$.
- The disposal of a non-ignitable organic liquid would still have to be dealt with.
- Normal MSDS recommendation is incineration.

Engineering Assessment

Preferred Option Justification

The preferred treatment option for the Tetrabutyl Titanate waste stream is Incineration in the Consolidated Incineration Facility (CIF).

This option treats the hazardous characteristic, ignitability, by converting the combustible fraction to carbon dioxide, water, and salt, and stabilizing residuals with cement.

This option is preferred because:

- Waste volume will be reduced by a factor of at least 2.
- Final waste form will meet LDR standards.
- Incineration and ash stabilization are demonstrated technologies.
- CIF is currently under construction.
- Residual solids are stabilized with cement.
- Cost is comparable to offsite incineration.

Treatability Study Requirements

This material is identical or very similar to design basis waste. No treatment studies *per se* will be needed. Nevertheless, process experts will evaluate what effect, if any, that the titanate will have on stabilizing the blowdown.

Options Rejected During IDOA

Incineration at Oak Ridge

Incineration at Oak Ridge was rejected because:

- Offsite incineration offers neither technological nor environmental advantage over the preferred option.

- Apparent cost advantage over the preferred option is a consequence of the accounting methods stipulated, which do not consider overhead and capital costs of offsite facilities.
- Extra handling to prepare the material of shipment off site increases the potential for personnel exposure.

Waste Stream Number & Name: SR-W059 Tetrabutyl Titanate (TBT)
Option Number: SR-W059-1
Facility: CIF

Treatment Technology Incineration

Treatment Cycle Flow Diagram:

Pros

- Expect at least 2:1 volume reduction.
- Little volume of secondary waste due to non-combustible sludge
- The waste stream is expected to meet all applicable LDR standards after treatment by this facility.
- Incinerator designed for a wide range of wastes with some operational limitations.
- Waste requires no additional treatment to meet shipping requirements.
- The final waste form meets the expected WAC upon exit from the process.
- Incineration is a current demonstrated technology, and all elements and processes have been previously demonstrated.
- Process failure should not create a waste that cannot be treated by existing technologies.
- Reasonably easy to schedule this waste stream assuming current startup schedule.
- Most of the metals will be captured in the ashcrete. Very little emissions resulting in little or no emissions from the facility even in an accident.
- Expect average numbers compared to industrial complex construction and operation. No impact due to this waste stream.
- No impact due to this waste stream. No increase in exposure potential and no additional workers are required.
- Full compliance anticipated. Processes are in full compliance with all applicable regulations and no variances are needed.
- Line item is funded.
- Final waste form will go to the LLW disposal.

Cons

- The public has limited acceptance of treatment involving incineration.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	70	Subtract 10 points from the median score of 80 because expect at least 2:1 volume reduction.
• secondary waste generation	80	Little volume of secondary waste due to non-combustible sludge.

Waste Stream Number & Name: SR-W059 Tetrabutyl Titanate (TBT)
Option Number: SR-W059-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
• destruction removal and demobilization efficiency	100	Add 20 points to the median score of 80 because the waste stream is expected to meet all applicable LDR standards after treatment by this facility.
• flexibility	100	Add 20 points to the median score of 80 because incinerator designed for a wide range of wastes with some operational limitations.
• ability to be shipped	80	Waste requires no additional treatment to meet shipping requirements.
• final waste form	100	Add 20 points to the median score of 80 because the final waste form meets the expected WAC upon exit from the process.
<i>Engineering Parameters</i>		
• system implementability	100	Incineration is a current demonstrated technology, and all elements. Add 20 points to the median score of 80 because processes have been previously demonstrated.
• availability	50	Incinerator availability for solids is 50%. Normal maintenance requirements apply. This waste stream may require a "clean-out" earlier than anticipated based on curie load.
• scalability	50	Process can accept a range of inputs but capacity is set by design. Excess capacity does exist at this point.
• remedial measures	70	Presence of metals in the secondary wastes might require rework. Subtract 10 points from the median score of 80 because little increase to the environment or public health is expected from this process failure should not create a waste that cannot be treated by existing technologies.
• schedule for treatment of waste	80	Reasonably easy to schedule this waste stream assuming current startup schedule.
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	80	Most of the metals will be captured in the ashcrete. Very little emissions resulting in little or no emissions from the facility even in an accident.
• non-operational worker potential exposure	80	Expect average numbers compared to industrial complex construction and operation. No impact due to this waste stream.
• operational worker potential exposure	80	No impact due to this waste stream. No increase in exposure potential and no additional workers are required.
• transportation potential exposure	70	Subtract 10 points from the median score of 80 because requires transportation – but limited risk.
<i>Regulatory Parameters</i>		
• need for variance	80	Full compliance anticipated. Processes are in full compliance with all applicable regulations and no variances are needed.
• ability to obtain a permit	80	This waste is part of the basis for permitting.
• waste disposal	80	Final waste form will go to the LLW disposal.
<i>Public Acceptance</i>		
• public acceptance	20	The public has limited acceptance of treatment involving incineration.

Waste Stream Number & Name: SR-W059 Tetrabutyl Titanate (TBT)
Option Number: SR-W059-1
Facility: CIF Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	80	Line item is funded.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because technology is being purchased.
• private sector involvement	100	Add 20 points to the median score of 80 because this is an existing technology.

IDOA Score: Technical 66 Total 79

Waste Stream Number & Name: SR-W059 Tetrabutyl Titanate (TBT)
Option Number: SR-W059-1
Facility: CIF Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: SRS
Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☒ Onsite ☐ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ 0	
1.2 Demonstration Costs	\$ N/A	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ 0	
1.3.2 Safety Assurance Documentation	\$ 0	
1.3.3 Permitting	\$ 0	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ 0	
TOTAL PRE-OPERATIONS		\$ 150
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ 0	
2.2 Inspection	\$ 0	
2.3 Project Management	\$ 0	
2.4 Building Construction (inc. indirect)	\$ 0	
2.5 Equipment (inc. indirect)	\$ 0	
2.6 Construction Management	\$ 0	
2.7 Contingency	\$ 0	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ 15	
3.2 Annual Utilities	\$ 1	
3.3 Annual Materials	\$ 9	
3.4 Annual Maintenance	\$ 5	
3.5 Annual Contingency	\$ 0	
TOTAL ANNUAL O & M	\$ 30	
X NUMBER OF YEARS OF OPERATION	0.25	
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 8
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ 0	
4.2 Closure, Post-Closure, Monitoring	\$ 1	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 1
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$	
5.2 Mobile Treatment	\$	
TOTAL CONTRACTED SERVICES		\$
6.0 Offsite Treatment (DOE)		\$
7.0 Transportation		\$
8.0 Disposal		\$ 10
SUB COST FOR INCINERATOR MODULE		\$ 168
ESCALATION		1.23
TOTAL COST		\$ 207

Waste Stream Number & Name: SR-W059 Tetrabutyl Titanate (TBT)
Option Number: SR-W059-2
Facility: TSCA, Oak Ridge

Treatment Technology Incineration

Treatment Technology

The controlled process by which combustible solid, liquid, or gaseous wastes are burned and changed into noncombustible gases and solid ash. (2) A treatment technology using combustion to destroy organic constituents and reduce the volume of wastes.

Pros

- Incineration achieves a volume reduction of more than 100 to 1.
- The incinerator can treat this stream without needing physical modifications.
- Incinerator is currently operational.
- Incinerator's availability is expected to be greater than 80%.
- Incinerator currently can handle this waste stream without modification.
- Process failure would not create a waste that could not be treated with existing technology.
- 80% of the waste is rendered non-hazardous by this process. Wastewater is further treated by the Central Neutralization Facility. The incinerator generated only 5 drums of ash per year, which require disposal in a mixed waste disposal site.

Cons

- Ash requires further treatment before it can be shipped.
- Significant additional waste characterization will be required for transportation.
- Facility is currently permitted only for treatment of onsite wastes. Major modification to the existing permits will be required before SRS wastes can be accepted.
- Public acceptance of incineration is low.

In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Process Parameters</i>		
• volume alteration	100	Add 20 points to median score of 80 because incineration achieves a volume reduction of more than 100 to 1.
• secondary waste generation	50	Although a small volume of secondary waste is produced, the ash is currently in storage, and not disposed of.
• destruction removal and demobilization efficiency	50	Ash requires further treatment to meet LDR.
• flexibility	80	The incinerator can treat this stream without needing physical modifications.
• ability to be shipped	20	Ash requires further treatment before it can be shipped.
• final waste form	50	The stabilized secondary wastes are expected to meet the SRS disposal WAC.
<i>Engineering Parameters</i>		
• system implementability	80	Incinerator is currently operational.
• availability	80	Incinerator's availability is expected to be greater than 80%.
• scalability	80	Incinerator currently can handle this waste stream without modification.
• remedial measures	80	Process failure would not create a waste that could not be treated with existing technology.
• schedule for treatment of waste	50	Schedule depends on the approval of permit modifications by the State of Tennessee.

Waste Stream Number & Name: SR-W059 Tetrabutyl Titanate (TBT)
Option Number: SR-W059-2
Facility: TSCA, Oak Ridge Treatment Technology Incineration
In-Depth Options Analysis Score Sheet

Attribute	Score	Discussion/Notes
<i>Personnel Parameters</i>		
• consequence of unmitigated accident scenarios	50	Few of no emissions for routine operations, but significant releases may occur under most accident scenarios.
• non-operational worker potential exposure	50	Exposure for non-operational workers will not increase due to incineration of this waste.
• operational worker potential exposure	50	Exposure for operational workers will not increase due to incineration of this waste.
• transportation potential exposure	20	Significant additional waste characterization will be required for transportation.
<i>Regulatory Parameters</i>		
• need for variance	20	Facility is currently permitted only for treatment of onsite wastes. Major modification to the existing permits will be required before SRS wastes can be accepted.
• ability to obtain a permit	50	Permitting process is well-defined, but similar processes have been previously permitted by the regulatory agencies with difficulty.
• waste disposal	80	80% of the waste is rendered non-hazardous by this process. Wastewater is further treated by the Central Neutralization Facility. The incinerator generated only 5 drums of ash per year, which require disposal in a mixed waste disposal site.
<i>Public Acceptance</i>		
• public acceptance	20	Public acceptance of incineration is low.
<i>Cost Considerations</i>		
• life cycle cost	99	
• funding availability	50	Funding to support offsite treatment is available, but budget levels may need to increase more than 10%.
<i>Industry Involvement</i>		
• market for technology	0	Subtract 20 points from the median score of 20 because application of existing commercial technology.
• private sector involvement	20	Incinerator is a GOCO facility.

IDOA Score: Technical 48 Total 61

Waste Stream Number & Name: SR-W059 Tetrabutyl Titanate (TBT)
Option Number: SR-W059-2
Facility: TSCA, Oak Ridge Treatment Technology Incineration
Cost Estimate Sheet

Waste Type: ☒ MLLW ☐ HLW ☐ M-TRU
☐ alpha ☒ non-alpha ☒ contact handled ☐ remote handled
Module Location: Oak Ridge
Module Status: ☒ Existing ☐ New ☒ Small generator ☐ Large generator
☐ Onsite ☒ Offsite ☐ Commercial ☐ Portable ☐ R&D

WBS Element	(\$ x 1000) Sub \$	(\$ x 1000) Element \$
1.0 Pre-Operations		
1.1 Studies and Bench Scale Tests	\$ _____	
1.2 Demonstration Costs	\$ _____	
1.3 Operations Budget Funded Activities		
1.3.1 Conceptual Design	\$ _____	
1.3.2 Safety Assurance Documentation	\$ _____	
1.3.3 Permitting	\$ _____	
1.3.4 Preparation for Operations	\$ 150	
1.3.5 Project Management	\$ _____	
TOTAL PRE-OPERATIONS		\$ 150
2.0 Facility Construction Cost		
2.1 Design (Title I and II)	\$ _____	
2.2 Inspection	\$ _____	
2.3 Project Management	\$ _____	
2.4 Building Construction (inc. indirect)	\$ _____	
2.5 Equipment (inc. indirect)	\$ _____	
2.6 Construction Management	\$ _____	
2.7 Contingency	\$ _____	
TOTAL FACILITY CONSTRUCTION COSTS		\$ 0
3.0 Operation and Maintenance		
3.1 Annual Operating Labor	\$ _____	
3.2 Annual Utilities	\$ _____	
3.3 Annual Materials	\$ _____	
3.4 Annual Maintenance	\$ _____	
3.5 Annual Contingency	\$ _____	
TOTAL ANNUAL O & M	\$ _____	
X NUMBER OF YEARS OF OPERATION		
TOTAL OPERATIONS AND MAINTENANCE COSTS		\$ 0
4.0 Decontamination & Decommissioning		
4.1 Facility D&D	\$ _____	
4.2 Closure, Post-Closure, Monitoring	\$ _____	
TOTAL DECONTAMINATION & DECOMMISSIONING		\$ 0
5.0 Contracted Services		
5.1 Commercial Treatment/Disposal	\$ _____	
5.2 Mobile Treatment	\$ _____	
TOTAL CONTRACTED SERVICES		\$ 0
6.0 Offsite Treatment (DOE)		\$ 12
7.0 Transportation		\$ 2
8.0 Disposal		\$ 10
SUB COST FOR INCINERATOR MODULE		\$ 174
ESCALATION		1.06
TOTAL COST		\$ 184

Note: Per DOE directions this cost carries no overhead burden or capital costs.

Waste Stream Number & Name: SR-W059 Tetrabutyl Titanate (TBT)
Option Number: SR-W059-3
Facility: Containment Building Treatment Technology Air Sparge

Option rejected during technical success factor evaluation. No further analysis performed.

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Summary Page

Waste Stream Number & Name: SR-W060 Tritiated Water with Mercury

Background Information

This waste stream went into LDR storage prior to the May 8, 1992 effective date for D009 waste, but was inadvertently missed in the MWIR. Closer analysis during the DSTP revealed the waste was not counted in the established MWIR waste stream, SR-W015 Mercury Contaminated Equipment, as presumed. Resulting from a one time weld failure of a thermal diffusion column in the 232H Tritium facility, this waste consists of 17 liters of tritiated water (with approximately 13,200 Ci), contaminated with 3-4 small droplets of mercury (D009A), and absorbed on 112 lbs of silica gel. The waste is contained in a specially fabricated, welded, stainless steel container and has been in permitted storage (643-29E) since October 19, 1989. The high tritium content complicates the use of standard waste water treatment for this waste.

Volume

- 0.2 m³
- No future generation anticipated – one time generation

Waste Stream Matrix

- Aqueous liquid

Waste Code

- D009A

LDR Treatment Standard

- Concentration based standard = 0.2 mg/l

Waste Characterization

- Process knowledge used to characterize the waste stream.
- Confidence level high

Radiological Characterization

- 13,200 curies tritium

In-Depth Options Analysis to be completed for the Final Site Treatment Plan.

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4.0 OTHER SITE WASTE STREAM EVALUATIONS

This section provides a description of the method used to evaluate SRS treatment of offsite waste streams.

4.1 Process Methodology Overview

Provided below is the three step process used to perform the initial screening for the potential treatment of offsite waste streams.

Step 1 Waste Stream Identification

Purpose

To evaluate the treatment of offsite waste streams for those sites that formally requested that such an evaluation be conducted.

Performed by

The identification of the waste streams was provided by site personnel within the DOE Complex, with support from the DOE and the DSTP technical core group.

Step 2 Initial Screening

Purpose

To identify waste streams that could be treated using SRS planned and/or existing treatment facilities. The screening was performed using the waste stream characterization information provided in the Mixed Waste Inventory Report (MWIR) as the basis. The MWIR descriptions and characterizations were compared against the waste acceptance criteria for the specific SRS treatment facilities to determine if SRS facilities could be used to provide the necessary treatment.

Performed by

The technical representative from each of the SRS treatment facilities performed the review with support provided from the DSTP technical core group.

Step 3 Waste Stream Selection

Purpose

To identify those waste streams that SRS can potentially treat. Waste streams identified as compatible with the waste acceptance criteria for a specific treatment facility were accepted as a potential treatment candidates.

Performed by

The technical representative from each of the SRS treatment facilities with support provided by the DSTP core group.

4.2 Other Site Waste Stream Evaluation Results

SRS evaluated offsite waste stream that could potentially be treated at the SRS. This section provides a summary of the number of DOE offsite waste streams evaluated, the number of waste streams that the SRS could treat and the number of waste streams that SRS has rejected.

In evaluating these waste streams being treated at the SRS, the treatment options reviewed were:

- Incineration/stabilization in the CIF
- Vitrification by an M-Area Vendor Treatment Process

The HW/MW Treatment Building was not considered in the treatment options review since this facility was not selected as a PO for onsite treatment of SRS waste.

Rocky Flats has identified 43 waste streams total, 14 of which were identified as potential waste streams for the CIF. All of the waste streams were reviewed to ensure that all potential waste treatment options were evaluated. M-Area evaluation of the waste stream was provided.

The Oak Ridge National Laboratories waste characterization data provided to date is the best information currently available per telephone conversation with Tom Rogers of Oak Ridge. SRS is not able to determine waste treatment options using the incomplete waste characterization. Oak Ridge is continuing waste characterization efforts.

Both the CIF and M-Area processes can be used to treat some of the same waste streams, therefore some waste streams have been identified as having more than one potential waste treatment option. This treatment overlap is included in the volume totals.

Table 4-1 summarizes the results.

Table 4-1

DOE Site	No. Waste Prov.	No. Streams Rejected	No. Streams SRS can Treat	SRS Facility	Complex Request Date	Waste Vol. (m ³)	Status
Charleston Naval Shipyard	4	1	3	3 CIF 1 M-Area	No formal request received	1.26 0.08	SRS evaluation completed 05/16/94.
Rocky Flats	43	28	15	14 CIF 1 M-Area	04/19/94	954.95 8.82	SRS evaluation completed 05/16/94.
Oak Ridge National Laboratory	28	28	Unk	Unk	06/10/94	Unk	Insufficient characterization information provided to adequately assess treatment.
West Valley	9	6	3	1 CIF 2 M-Area	06/10/94	0.02 0.14	SRS evaluation completed 05/16/94.
Idaho National Engineering Laboratory	52	25	27	21 CIF 17 M-Area	05/05/94	4215.50 126.58	CIF evaluation complete 05/16/94. M-Area draft screening provided 06/08/94.
Naval Reactors	62	21	41	39 CIF 3 M-Area	06/07/94	167.72 1.03	SRS evaluation completed 06/10/94.
Hanford	24	5	19	17 CIF 3 M-Area	05/31/94	TBD TBD	SRS evaluation completed 07/28/94
Total	198	109	89	78 CIF 24 M-Area		5339.45 136.65	

4.3 SRS Initial Assessment of Offsite Waste Streams for Treatment at SRS

This section provides an evaluation of DOE offsite waste streams requested to be treated at the SRS. Justification is provided for those waste streams which the SRS cannot treat.

Charleston Naval Shipyard

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
CN-W002	Elemental Lead	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	2.29
CN-W004	Lead-contaminated Organic Debris	CIF – Solid Feed		0.16
CN-W001	Chromate-contaminated Organic Debris	CIF – Solid Feed M-Area – VTF		0.80
CN-W003	Lead/Chromium-based Paint Chips	CIF – Solid Feed		0.30

Rocky Flats

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
RF-W016	Acids	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	9.5
RF-W077	Acidic Oils	None	Waste exceeds WAC limits for CIF. Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	1.68
RF-W047	Analytical Lab Sources	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	3.73
RF-W020	Beryllium Fines	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	2.17
RF-W003	Contaminated Composite Chips	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	90.6
RF-W006	Combustibles	CIF – Solid Feed		682.6
RF-W014	Cutoff Sludge	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	7.95
RF-W054	Cyanides	CIF – Liquid Feed		0.84
RF-W021	Electrochemical Milling Sludge	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.84
RF-W051	Excess Chemicals	CIF – Liquid Feed CIF – Solid Feed		33.3
RF-W074/ 075	Filters (Cemented)	CIF – Solid Feed		17.8 6.7
RF-W015	Fluidized Bed Incinerator Oil	CIF – Liquid Feed		89.8
RF-W043	Glass	None	Incompatible waste matrix. Inappropriate treatment for LDR.	8.86
RF-W035	Glovebox Parts with Lead	None	Incompatible waste matrix. Incompatible waste matrix.	17.31
RF-W024	Ground Glass	None	Incompatible waste matrix. Inappropriate treatment for LDR.	13.79

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
RF-W042	Heavy Metal (non-SS)	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	1.26
RF-W022	Incinerator Ash	M-Area VTF		8.82
RF-W045	Insulation	None	Incompatible waste matrix. Inappropriate treatment for LDR.	4.64
RF-W023	Lead	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	40.87
RF-W030	Leaded Gloves	None	Incompatible waste matrix. Policy restriction.	5.53
RF-W031	Leaded Gloves/Acid Contaminated	None	Incompatible waste matrix. Policy restriction.	.21
RF-W005	Metal	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	68.10
RF-W049	Miscellaneous Liquids	CIF – Liquid Feed		6.0
RF-W061	Miscellaneous Pu Recovery By-Products	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.21
RF-W046	Organics – Discard Level	CIF – Liquid Feed		52.1
RF-W027	Paints	CIF – Liquid Feed		0.4
RF-W071	Particulate Sludge	CIF – Solid Feed		54.0
RF-W017	Polychlorinated Biphenyl (PCB) Liquids	CIF – Liquid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated waste.	1.3
RF-W002	Polychlorinated Biphenyl (PCB) Solids	CIF – Solid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated waste.	9.5
RF-W018	Pondcrete	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	6164.35
RF-W007	Roaster Oxide	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	82.74
RF-W019	Saltcrete	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	5025.86
RF-W048	Sand from Button Breakout	None	Incompatible waste matrix. Policy restriction.	0.21
RF-W053	Silver Nitrate	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.84
RF-W050	Soil and Cleanup Debris	None	Incompatible physical matrix.	423.4
RF-W064	Solar Pond Water	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	45925
RF-W009	Solidified Bypass Sludge		Incompatible waste matrix. Inappropriate treatment for LDR.	547.01

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
RF-W062	Solidified Organics	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	1.96
RF-W044	Solidified Process Solids	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	4.75
RF-W055	Turnings	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	11.97
RF-W025	Used Absorbent (Oil Dry)	CIF - Solid Feed		0.21
RF-W073	Organic Resin	CIF - Solid Feed		0.4

Oak Ridge National Laboratory

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
	Combustible Debris	Unknown	Insufficient waste characterization information available.	
	Organic Process Residues	Unknown	Insufficient waste characterization information available.	
	Metallic Solvent Solids	Unknown	Insufficient waste characterization information available.	
	U Contaminated Residues and Combustibles	Unknown	Insufficient waste characterization information available.	
	Ignitable Solids	Unknown	Insufficient waste characterization information available.	
	Plating Process Treatment Solids	Unknown	Insufficient waste characterization information available.	
	Solvent and Plating Solution Treatment Solids	Unknown	Insufficient waste characterization information available.	
	Ignitable Organic Solids	Unknown	Insufficient waste characterization information available.	
	Ignitable Metallic Organic Solids	Unknown	Insufficient waste characterization information available.	
	Ignitable Corrosive Solids	Unknown	Insufficient waste characterization information available.	
	Plating Process Solids	Unknown	Insufficient waste characterization information available.	
	Ignitable Solvent Sludges	Unknown	Insufficient waste characterization information available.	
	Oil Rags and Solids	Unknown	Insufficient waste characterization information available.	
	K-1232 Spent Carbon Filter Agent	Unknown	Insufficient waste characterization information available.	
	Laboratory Trash	Unknown	Insufficient waste characterization information available.	
	Centrifuge Epoxies/Resins	Unknown	Insufficient waste characterization information available.	
	Oxidizing Solids (bulk)	Unknown	Insufficient waste characterization information available.	

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
	Hazardous Waste Solids (MWIR 1126)	Unknown	Insufficient waste characterization information available.	
	RQ Hazardous Waste Solid (MWIR 1127)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1129)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1130)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1131)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1128)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1136)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1133)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solids (MWIR 1134)	Unknown	Insufficient waste characterization information available.	
	RQ Hazardous Waste Solid (MWIR 1135)	Unknown	Insufficient waste characterization information available.	
	Hazardous Waste Solid (MWIR 1132)	Unknown	Insufficient waste characterization information available.	

West Valley

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
WV-W013	Pu Aqueous Waste	None	Facilities not designed to treat TRU wastes.	0.734
WV-W029	Immersion Bucket Solution	M-Area - LETF		0.139
WV-W030	Aqueous Laboratory Waste	None	Inappropriate treatment for LDR.	0.005
WV-W034	Acidic Metal Aqueous Wastes	M-Area - VTF		0.0006
WV-W002	Low Level Radioactive Lead	None	Incompatible waste matrix. Inappropriate treatment for LDR.	1.39
WV-W007	Pyridine/Cyanide Waste	CIF - Solid Feed		0.02
WV-W020	Mercury Waste	None	Incompatible waste matrix. Inappropriate treatment for LDR.	1.965
WV-W024	TRU Lead Waste	None	Facilities not designed to treat TRU wastes.	2.19
WV-W038	Fluorescent Light Bulbs	None	Incompatible waste matrix. Inappropriate treatment for LDR.	0.0334

Idaho National Engineering Laboratory

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
AW-W001	Cadmium Metal Ingots	M-Area – VTF		0.46
AW-W002	Shielding Material and Lead-lined Gloves	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.97
AW-W006	Sodium Contaminated Paper and Cloth	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	2.85
AW-W007	Sodium Reactor Coolant	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	5.2
AW-W008	Sodium Potassium Alloy	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.19
AW-W013	Contaminated Hg-IBC Cask Matrix	None	Waste exceeds WAC limits. Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.10
AW-W018	Sodium Reactor Coolant	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.145
AW-W019	Sodium Potassium Alloy	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.01
AW-W023	Cadmium Contaminated Cleanup Waste	CIF – Solid Feed M-Area – VTF		0.03
IN-W002	EDTA and Lead	CIF – Liquid Feed M-Area – VTF		0.15
IN-W003	Solid Lead Bricks	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.06
IN-W009	Radioactive Calibration Sources	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.004
IN-W014	Cadmium Sheetting	M-Area – VTF		0.32
IN-W018	Heavy Metal Liquid Laboratory Waste	CIF – Ashcrete M-Area – VTF		0.91
IN-W019	Solid and Semisolid Concrete	M-Area – VTF		5.76
IN-W021	TRA Scintillation Cocktails	CIF – Liquid Feed		0.32
IN-W027	Lead Contaminated Debris	CIF – Solid Feed		13.2
IN-W028	Lead Bricks, Sheets Blankets and Scrap	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	399.82
IN-W032	WERF Ash (Failed EP TOX or TCLP)	M-Area – VTF		3.25
IN-W033	Heterogeneous Inorganic Debris	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	2.29

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
IN-W038	TAN Decon Solvent Waste	CIF – Liquid Feed M-Area – LETF		5.9
IN-W041	IET Liquid Waste	CIF – Ashcrete M-Area – LETF		0.4
IN-W042	S1G Decon Sodium	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.25
IN-W045	EBRI Decon Sodium and liquid metal	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.681
IN-W048	WEDF Solidification Tests	CIF – Ashcrete M-Area – VTF		0.08
IN-W049	HTRE III, PPE Waste	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.6
IN-W056	Electroplating Solution	CIF – Ashcrete M-Area – VTF		0.11
IN-W058	Cadmium Contaminated Fuel Grids	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	37.8
IN-W060	Mercury contaminated Soil	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	6.88
IN-W064	Radioactive PCB Oil with TCLP Organics	CIF – Liquid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated wastes.	0.42
IN-W065	Radioactive PCB Oil with Heavy Metals	CIF – Liquid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated waste.	0.21
IN-W070	WERF Incinerator Refractory Brick	M-Area – VTF		3.0
IN-W071	Radioactive Lead	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	5.4
IN-W077	Melter Test Waste	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.03
IN-W084	Lead Shielding	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.5
IN-W085	Lead Bricks	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	17.20
IN-W086	Lead Bricks	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	4.3
IN-W108	Metal Waste Contaminated with Lead	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.2
IN-W109	Cadmium Contaminated Solids	CIF – Solid Feed		42.6
IN-W111	Lead Bricks, Sheets, and Ties	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	810.4

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
IN-W118	SS Fuel Racks with Cadmium	M-Area – VTF		41.23
IN-W119	Liquid Acid/Mercury Mixed Wastes	CIF – Ashcrete		4.33
IN-W120	Liquid High Chloride Corrosive Mixed Waste	CIF – Ashcrete M-Area – LETF		5.55
IN-W122	Contaminated Debris	CIF – Solid Feed		4071
IN-W123	LLW APS HEPA Filters	CIF – Solid Feed M-Area – VTF		53.2
IN-W124	D006-D011 Contaminated Solids	CIF – Solid Feed		10.23
IN-W126	LET and D HEPA Filters	CIF – Solid Feed M-Area – VTF		5.74
IN-W153	Lead Bricks, Sheets and Scrap	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	35.4
IN-W155	Drill Cutting Contaminated With Lead	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.03
IN-W156	Lead Contaminated Debris	CIF – Solid Feed		0.21
IN-W377	Treatability Study Residues	CIF – Ashcrete M-Area –VTF		0.49
IN-W379	Laboratory Equipment and Debris	CIF – Solid Feed		0.42

Naval Reactors

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
NN-W002	Solid Waste Contaminated With Chromium	CIF – Solid Feed		3.0
CN-W001	Solids Containing Potassium Chromate	CIF – Solid Feed		0.8
CN-W002	Lead and Lead Bearing Materials	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	2.54
CN-W004	Organic Debris with Lead and/or Chromium	CIF – Solid Feed		0.24
BT-W001	Oil Containing Heavy Metals #1	CIF – Solid Feed		10.91
BT-W002	Spent M-192 Solvent Rags	CIF – Solid Feed		0.21
BT-W003	Oil Containing Heavy Metals #2	CIF – Solid Feed		0.75
BT-W007	Solids with Solvents	CIF – Solid Feed		7.14
BT-W008	Mercury Containing Waste	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.21
BT-W010	Waste Oil with Heavy Metals and PCBs	CIF – Liquid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated waste.	0.21

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
BT-W011	Sludge Containing Solvents	CIF – Solid Feed		0.026
BT-W016	Scintillation Standards	CIF – Liquid Feed		0.012
BT-W017	Ion Exchange Resin	CIF – Solid Feed		0.001
BT-W019	Lead	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	5.92
KK-W001	Filters Contaminated with Lead and Silver	CIF – Solid Feed M-Area – VTF		0.2
KK-W008	Organic Sludges/Particulate	CIF – Solid Feed		25.2
KK-W009	Organic Debris without Metals	CIF – Solid Feed		2.4
KA-W003	Trichloroethylene	CIF – Solid Feed		0.3
KA-W005	Asbestos Contaminated with Mercury	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.2
KA-W006	Freon 113 on Rags	CIF – Solid Feed		0.4
KA-W010	Mercury Debris Containing Heavy Metals	CIF – Ashcrete		3.0
KA-W013	Organic Debris with Heavy Metals	CIF – Solid Feed		2.4
KA-W014	Organic Sludges/Particulate with Heavy Metals	CIF – Solid Feed		2.4
KW-W006	Organic Sludges/Particulate with Heavy Metals	CIF – Solid Feed		4.8
PH-W004	Solidified Waste with Chromate	CIF – Solid Feed		0.28
KK-W010	Lead Bricks, Sheets or Wool	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	6.0
KA-W011	Lead Bricks, Sheets or Wool	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	6.1
KW-W007	Lead Bricks, Sheets or Wool	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	10.0
PN-W001	Lead Contaminated Debris	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.2
PN-W003	Solidified Resin with Chromium	M-Area – VTF		0.21
PS-W003	Felt with Chromium and PCBs	CIF – Solid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated waste.	6.1
PS-W007	Debris with Heavy Metal and PCBs	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	10.0

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
PS-W011	Debris with TCLP Metals/F-Listed Solvents	CIF - Solid Feed		0.22
PS-W012	Chromium and Lead Based Paint Chips with PCBs	CIF – Solid Feed	A TSCA Permit and trial burn will be required prior to treatment of PCB contaminated waste.	2.0
BT-W009	VOC Contaminated Soil	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.42
BT-W012	VOC and PCB Contaminated Debris	CIF – Solid Feed		8.52
BT-W013	VOC and PCB Contaminated Soil	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	1.97
BT-W014	Zirconyl Nitrate	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.013
BT-W018	TCLP Extract Fluid	CIF – Liquid Feed		0.006
KK-W002	Cadmium Plated Solids	M-Area – LETF		0.62
KK-W003	Oils	CIF – Liquid Feed		6.0
KK-W005	Organic Debris with Heavy Metals	CIF – Solid Feed		22.82
KK-W006	Inorganic Debris and Equipment	CIF – Solid Feed		3.3
KK-W007	Inorganic Sludges/Particulate	CIF – Solid Feed		3.0
KK-W011	Cutting Oils and Liquids	CIF – Liquid Feed		2.4
KK-W012	Miscellaneous Laboratory Chemicals	Unknown	Insufficient waste characterization information available.	6.0
KK-W013	Soils	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	121.8
KK-W015	Soils	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	NDB
KA-W001	Miscellaneous Laboratory Chemicals	Unknown	Insufficient waste characterization information available.	12.0
KA-W002	Cutting Oils, Liquids, Lubricants	CIF – Liquid Feed		0.6
KA-W004	Mercury Metals	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	0.31
KA-W007	Oils Containing Heavy Metals and Solvents	CIF – Liquid Feed		12.1
KA-W008	Miscellaneous Laboratory Chemicals	Unknown	Insufficient waste characterization information available.	4.2
KA-W009	Organic Debris with Heavy Metals	CIF – Solid Feed		12.6
KA-W012	Inorganic Sludge/particulate with Heavy Metals	CIF – Solid Feed		2.4

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
KW-W001	Oil with Heavy Metals	CIF – Liquid Feed		1.075
KW-W002	Miscellaneous Laboratory Chemicals	Unknown	Insufficient waste characterization information available.	0.2
KW-W003	Organic Debris with Heavy Metals	CIF – Solid Feed		6.0
KW-W004	Inorganic Debris and Equipment	CIF – Solid Feed		13.3
KW-W005	Inorganic Sludges/Particulate with Heavy Metals	CIF – Solid Feed		0.6
KW-W008	Miscellaneous Laboratory Chemicals	Unknown	Insufficient waste characterization information available.	0.6
KW-W009	Soils	None	Incompatible physical matrix. Inappropriate treatment for LDR at both CIF and M-Area.	16.8

Hanford

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
RL-W017	Ignitable Liquids	CIF – Solid Feed		44.44
RL-W020	TC Metal Sludge/Dry Particulate (Hg)	CIF – Solid Feed M-Area – VTF		1607.14
RL-W021	TC Metal Sludges/Dry Particulate (Ca, Hg)	CIF – Solid Feed		21.42
RL-W022	Non-TC Metal/Solvent Sludges/Dry Particulate	M-Area – VTF		
RL-W034	Lead Acid Batteries	None	Incompatible physical matrix and inappropriate treatment does not meet LDR.	
RL-W035	Radioactive Lead Soils	None	Incompatible physical matrix and inappropriate treatment does not meet LDR.	
RL-W037	Radioactive Elemental Mercury (Ca)	None	Incompatible physical matrix and inappropriate treatment does not meet LDR.	
RL-W038	Mercury Sludges/Dry Particulate (Hg>260 mg/Hg)	None	Incompatible physical matrix and inappropriate treatment does not meet LDR.	
RL-W039	Organic RMW PCB Liquids 50-500 ppm (Ca)	CIF – Solid Feed CIF – Liquid Feed		
RL-W040	Organic RMW PCB Liquids >500 ppm (Ca)	CIF – Solid Feed CIF – Liquid Feed		
RL-W044	Appendix IV Labpacks (Ca, Hg)	CIF – Solid Feed CIF – Liquid Feed		69.28
RL-W046	Appendix IV Labpacks	CIF – Solid Feed CIF – Liquid Feed		705.89

Waste Stream No.	DOE SITE/ Waste Stream	SRS Treatment Facility	Justification	30 Yr. Forecast Vol. (m ³)
RL-W051	Solvent/TC Metal Soils (Hg)	None	Incompatible physical matrix and inappropriate treatment does not meet LDR.	
RL-W052	Solvent Sludges/Dry Particulate	CIF – Solid Feed		166.11
RL-W053	Solvent/TC Metal Sludges/Dry Particulate (Ca)	CIF – Solid Feed		3.06
RL-W054	Solvent/TC Metal Sludges/Dry Particulate (Ca)	CIF – Solid Feed		
RL-W061	Solvent/TC Metal Organic Solid Debris (Ca, Q)	CIF – Solid Feed		107.15
RL-W062	Solvent Radioactive Lead	CIF – Solid Feed		4.46
RL-W063	Solvent Appendix IV Labpacks	CIF – Solid Feed CIF – Liquid Feed		336.72
RL-W064	Solvent Appendix IV Labpacks (Ca)	CIF – Solid Feed CIF – Liquid Feed		3671.23
RL-W065	Solvent Appendix V Labpacks	CIF – Solid Feed CIF – Liquid Feed		2117.32
RL-W066	Solvent Appendix V Labpacks (Ca)	CIF – Solid Feed CIF – Liquid Feed		840.79
RL-W067	Solvent Appendix V Labpacks (Ca, Q)	CIF – Solid Feed CIF – Liquid Feed		21.42
RL-W091	Cadmium Batteries	M-Area – VTF		

4.4 Offsite Waste Streams for which SRS Treatment is the PO

Naval Reactors has selected SRS mixed waste treatment facilities as preferred options in the Naval Reactors Program DSTP. SRS has completed its evaluation confirming its ability to treat Naval Reactors mixed wastes.

SRS cannot fully determine a schedule for treating Naval Reactors wastes at this time. The schedule for acceptance of offsite DOE Complex waste will depend on the volume and characterization of waste to be treated as well as prioritization of onsite and offsite waste treatment. WSRC has recommended that the DOE Complex develop prioritization protocols for treatment of mixed waste to ensure timely treatment of wastes subject to RCRA Land Disposal Restriction and wastes not stored in compliance with RCRA regulations.

Prior to actual acceptance of Naval Reactors wastes major changes to the SRS facility baseline documents including regulatory permits will be required prior to the initiation of waste treatment operations. The required modifications to the baseline documents have not been forecasted, and an accurate schedule for waste treatment operations has not been determined at this time.

WSRC has assumed that all waste treatment residues returned to the generating site would meet the published disposal waste acceptance criteria for the specified site.

Table 4.4.1 identifies the SRS treatment facilities selected as preferred options for Naval Reactors mixed wastes.

Table 4.4.1

Naval Reactors

Waste Stream No.	DOE Site/ Waste Stream	SRS Treatment Facility	Potential Issues	30 Yr. Forecast Vol. (m ³)
NN-W002	Solid Waste Contaminated With Chromium	CIF – Solid Feed		3.0
CN-W001	Solids Containing Potassium Chromate	CIF – Solid Feed		0.8
CN-W004	Organic Debris with Lead and/or Chromium	CIF – Solid Feed		0.24
BT-W001	Oil Containing Heavy Metals #1	CIF – Solid Feed		10.91
BT-W002	Spent M-192 Solvent Rags	CIF – Solid Feed		0.21
BT-W003	Oil Containing Heavy Metals #2	CIF – Liquid Feed		0.75
BT-W007	Solids with Solvents	CIF – Solid Feed		7.14
BT-W017	Ion Exchange Resin	CIF – Solid Feed	Treatment of this waste may be impacted by the new EPA Policy that prohibits incineration of inorganic waste containing hazardous metals. If surface radiation rate exceeds 10 mR/hr. the waste cannot be treated at CIF.	0.001
KK-W001	Filters Contaminated with Lead and Silver	CIF – Solid Feed M-Area –VTF	Treatment of this waste may be impacted by the new EPA Policy that prohibits incineration of inorganic waste containing hazardous metals.	0.2
KK-W008	Organic Sludges/Particulate	CIF – Solid Feed	If this waste contains D009B or D009c waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	25.2
KK-W009	Organic Debris without Metals	CIF – Solid Feed	TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	2.4
KA-W003	Trichloroethylene	CIF – Solid Feed		0.3
KA-W006	Freon 113 on Rags	CIF – Solid Feed		0.4
KA-W013	Organic Debris with Heavy Metals	CIF – Solid Feed	TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	2.4

Waste Stream No.	DOE Site/ Waste Stream	SRS Treatment Facility	Potential Issues	30 Yr. Forecast Vol. (m ³)
KA-W014	Organic Sludges/Particulate with Heavy Metals	CIF – Solid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	2.4
KW-W006	Organic Sludges/Particulate with Heavy Metals	CIF – Solid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	4.8
BT-W018	TCLP Extract Fluid	CIF – Liquid Feed		0.006
KK-W003	Oils	CIF – Liquid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	6.0
KK-W005	Organic Debris with Heavy Metals	CIF – Solid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes. If waste contains D008c the lead solids must be removed prior to treatment at the CIF to meet the LDR Treatment Standards for D008C wastes.	22.82
KK-W007	Inorganic Sludges/Particulate	CIF – Solid Feed	Treatment of this waste may be impacted by the new EPA Policy that prohibits incineration of inorganic waste containing hazardous metals. If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	3.0
KK-W011	Cutting Oils and Liquids	CIF – Liquid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	2.4
KA-W002	Cutting Oils, Liquids, Lubricants	CIF – Liquid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	0.6

Waste Stream No.	DOE Site/ Waste Stream	SRS Treatment Facility	Potential Issues	30 Yr. Forecast Vol. (m ³)
KA-W007	Oils Containing Heavy Metals and Solvents	CIF – Liquid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	12.1
KA-W009	Organic Debris with Heavy Metals	CIF – Solid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	12.6
KA-W012	Inorganic Sludge/particulate with Heavy Metals	CIF – Solid Feed	Treatment of this waste may be impacted by the new EPA Policy that prohibits incineration of inorganic waste containing hazardous metals. If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations. TSCA permit and trial burn will be required prior to treatment of PCB contaminated wastes.	2.4
KW-W001	Oil with Heavy Metals	CIF – Liquid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	1.075
KW-W003	Organic Debris with Heavy Metals	CIF – Solid Feed	If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	6.0
KW-W004	Inorganic Debris and Equipment	CIF – Solid Feed	Treatment of this waste may be impacted by the new EPA Policy that prohibits incineration of inorganic waste containing hazardous metals. If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	13.3
KW-W005	Inorganic Sludges/Particulate with Heavy Metals	CIF – Solid Feed	Treatment of this waste may be impacted by the new EPA Policy that prohibits incineration of inorganic waste containing hazardous metals. If this waste contains D009B or D009C waste it cannot be accepted for treatment at the CIF, due to stack emission limitations.	0.6
CN-W007	Flammable Organic Debris	CIF – Solid Feed		

5.0 SUMMARY INFORMATION

5.1 Preferred Option Summary (by Waste Stream)

Waste Stream No.	Waste Stream Name	PO	Current cumulative inventory through 09/30/93 (m ³)	Future forecast generation ('93-'97) (m ³)
SR-W001	Rad-Contaminated Solvents	CIF – Incineration	0.4	2.0
SR-W002	Rad-Contaminated Chlorofluorocarbons	CIF – Incineration	1.0	3.0
SR-W003	Solvent Contaminated Debris (LLW)	CIF – Incineration	5.4	2.0
SR-W004	M-Area Plating Line Sludge from Supernate Treatment	M-Area Vendor Treatment Process	356	490
SR-W005	Mark 15 Filter Cake	M-Area Vendor Treatment Process	15.4	0
SR-W006	Mixed TTA/Xylene	TRU Waste Management Plan	0.1	0
SR-W007	SRL (SRTC) Low Activity Waste	SRTC Ion Exchange	71.5	375
SR-W008	SRL (SRTC) High Activity Waste	SRTC Ion Exchange	77.4	375
SR-W009	Silver Coated Packing Material	Containment Bldg. – Macroencapsulation in S. S. Container	10.2	3.1
SR-W010	Scintillation Solution	CIF – Incineration	3.6	0
SR-W011	Cadmium Coated HEPA Filter	M-Area Vendor Treatment Process	100.2	0
SR-W012	Toxic Cleanup Material	CIF – Incineration	0.8	1.0
SR-W013A	Low-Level Waste Lead (Uncombined Elemental Lead)	Offsite Vendor	86.4	30
SR-W013B	Low-Level Waste Lead (Combined Lead)	Macroencapsulation – Location TBD	86.4	30
SR-W014	Tritiated Mercury	Offsite DOE-INEL-WEDF Amalgamation	0.3	0.1
SR-W015	Mercury Contaminated Equipment	Containment Bldg. – Macroencapsulation in S. S. Container	9.8	3.1
SR-W016	221-F Canyon High Level Liquid Waste (HLW)	DWPF	54,160	7,350
SR-W017	221-H Canyon High Level Liquid Waste (HLW)	DWPF	74,180	6,220
SR-W018	Filter Paper Take Up Rolls	CIF – Incineration	257	5.0
SR-W019	244-H RBOF High Activity Liquid Waste	Consolidated with SR-W017	0	0
SR-W020	In-Tank Precipitation (ITP) Filters	Meets Treatment Standard	0	16.3
SR-W021	Poisoned Catalyst Material	Waste stream eliminated	0	0
SR-W022	Defense Waste Processing Facility (DWPF) Benzene	CIF – Incineration	0	380
SR-W023	Safety/Control Rods	Macroencapsulation in a cask, as a 90-day generator	0.3	3.2
SR-W024	Gold Traps	Meets Treatment Standard	2.3	0.2

Waste Stream No.	Waste Stream Name	PO	Current cumulative inventory through 09/30/93 (m ³)	Future forecast generation ('93-'97) (m ³)
SR-W025	Solvent Waste <100 nCi/g TRU	TRU Waste Management Plan	2791.2	0
SR-W026	Thirlds TRU Waste	TRU Waste Management Plan	67	204
SR-W027	Solvent TRU Waste	TRU Waste Management Plan	4955.6	0
SR-W028	Mark 15 Filter Paper -- F006	CIF -- Incineration	1.0	0
SR-W029	M-Area Sludge Treatability Samples	M-Area Vendor Treatment Process	1.0	0
SR-W030	Spent Methanol Solution	CIF -- Incineration	0.2	0
SR-W031	Uranium/Chromium Solution	M-Area Vendor Treatment Process	0.6	0
SR-W032	Mercury Contaminated Heavy Water	D-Area Facility	9.6	0
SR-W033	Thirlds Waste <100 nCi/g TRU Rad	TRU Waste Management Plan	8.0	25
SR-W034	Calcium Metal	Containment Bldg. -- Wet Oxidation	0.8	0
SR-W035	Freon 11/Oil Mixture	CIF -- Incineration	2.0	0
SR-W036	Radioactive Oil	Pretreatment by Aging	17.2	1.6
SR-W037	M-Area High Nickel Plating Line Sludge	M-Area Vendor Treatment Process	1,190	0
SR-W038	Plating Line Sump Material	M-Area Vendor Treatment Process	0.4	0
SR-W039	Nickel Plating Line Solution	M-Area Vendor Treatment Process	5.0	0
SR-W040	M-Area Stabilized Sludge	Waste stream eliminated	0	754
SR-W041A	Aqueous Mercury and Lead	Effluent Treatment Facility	0.09	0
SR-W041B	Aqueous Mercury and Lead (Elemental Liquid Mercury)	Offsite DOE-INEL WEDF Stabilization	0.01	0
SR-W041C	Aqueous Mercury and Lead (Mercury Contaminated Recorder)	Containment Bldg. -- Macroencapsulation in S. S. Container	0.1	0
SR-W042	Paints and Thinners	CIF -- Incineration	5.3	5.0
SR-W043	Lab Waste w/Tetraphenyl Borate	CIF -- Incineration	0.2	2.6
SR-W044	Tributyl Phosphate & N-paraffin -- TRU	Consolidated with SR-W045	0	0
SR-W045	Tributyl Phosphate & n-Paraffin	CIF -- Incineration	107	0
SR-W046	Consolidated Incinerator (CIF) Ash	CIF -- Ashcrete	0	62
SR-W047	Consolidated Incinerator (CIF) Blowdown	CIF -- Ashcrete	0	400
SR-W048	Waste Sites/Spill Site Soil	M-Area Vendor Treatment Process	18.2	0
SR-W049	Tank E-3-1 Clean Out Material	Offsite DOE-INEL-WEDF Stabilization	1.4	0

Waste Stream No.	Waste Stream Name	PO	Current cumulative inventory through 09/30/93 (m ³)	Future forecast generation ('93-'97) (m ³)
SR-W050	Mixed Waste to Support HL Waste Processing Demonstrations	Pretreatment - SRTC 90-day generator Treatment vitrification	0.1	0.4
SR-W051	Spent Filter Cartridges	CIF - Incineration	0.6	0
SR-W052	Cadmium Contaminated Glovebox Section	Waste stream eliminated	0	0
SR-W053	Rocky Flats Incinerator Ash	Return to Rocky Flats	0.1	0
SR-W054	Enriched Uranium Contaminated with Lead	Consolidated with SR-W037	0.1	0
SR-W055	Job Waste Containing Solvent Contaminated Wipes	CIF - Incineration	951	0
SR-W056	Job Waste with Enriched Uranium and Solvent Applicators	CIF - Incineration	260	0
SR-W057	D-Tested Neutron Generators	Waste stream eliminated	0	0
SR-W058	Mixed Sludge Waste with Mercury-DWPF Treatability Studies	Pretreatment - SRTC 90-day generator Treatment vitrification	0.1	0
SR-W059	Tetrabutyl Titanate (TBT)	CIF - Incineration	0.8	0
SR-W060	Tritiated Water with Mercury	TBD	0.2	0

5.2 Preferred Option Summary (by Facility)

Waste Stream No.	Waste Stream Name	Current cumulative inventory through 09/30/93 (m ³)	Future forecast generation ('93-'97) (m ³)
Consolidated Incineration Facility (CIF)			
<u>Treatment Standard – Incineration</u>			
SR-W001	Rad-Contaminated Solvents	0.4	2.0
SR-W002	Rad-Contaminated Chlorofluorocarbons	1.0	3.0
SR-W003	Solvent Contaminated Debris (LLW)	5.4	2.0
SR-W010	Scintillation Solution	3.6	0
SR-W012	Toxic Cleanup Material	0.8	1.0
SR-W022	Defense Waste Processing Facility(DWPF) Benzene	0	380
SR-W030	Spent Methanol Solution	0.2	0
SR-W035	Freon 11/Oil Mixture	2.0	0
SR-W055	Job Waste Containing Solvent Contaminated Wipes	951	0
SR-W056	Job Waste with Enriched Uranium and Solvent Applicators	260	0
SR-W059	Tetrabutyl Titanate (TBT)	0.8	0
<u>Treatment Standard – Other Than Incineration</u>			
SR-W018	Filter Paper Take Up Rolls	257	5.0
SR-W028	Mark 15 Filter Paper – F006	1.0	0
SR-W042	Paints and Thinners	5.3	5.0
SR-W043	Lab Waste w/Tetraphenyl Borate	0.2	2.6
SR-W045	Tributyl Phosphate & n-Paraffin	107	0
SR-W051	Spent Filter Cartridges	0.6	0
<u>Ashcrete Stabilization</u>			
SR-W046	Consolidated Incinerator (CIF) Ash	0	62
SR-W047	Consolidated Incinerator (CIF) Blowdown	0	400
D-Area Heavy Water Operations Facility			
SR-W032	Mercury Contaminated Heavy Water	9.6	0
Effluent Treatment Facility Wastewater Treatment			
SR-W041A	Aqueous Mercury and Lead	0.09	0
Defense Waste Processing Facility			
SR-W016	221-F Canyon High Level Liquid Waste (HLW)	54,160	7,350
SR-W017	221-H Canyon High Level Liquid Waste (HLW)	74,180	6,220

M-Area Vendor Treatment Process

Design Basis Waste Streams

SR-W004	M-Area Plating Line Sludge from Supernate Treatment	356	490
SR-W005	Mark 15 Filter Cake	15.4	0
SR-W029	M-Area Sludge Treatability Samples	1.0	0
SR-W037	M-Area High Nickel Plating Line Sludge	1,190	0
SR-W038	Plating Line Sump Material	0.4	0
SR-W039	Nickel Plating Line Solution	5.0	0

Newly Identified Streams

SR-W031	Uranium/Chromium Solution	0.6	0
SR-W048	Waste Sites/Spill Site Soil	18.2	0

M-Area Liquid Effluent Treatment Facility followed by M-Area Vendor Treatment Process

SR-W011	Cadmium Coated HEPA Filters	100.2	0
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SRTC Low Activity Waste Storage Tanks - Ion Exchange

SR-W007	SRL (SRTC) Low Activity Waste	71.5	375
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SRTC High Activity Waste Storage Tanks - Ion Exchange

SR-W008	SRL (SRTC) High Activity Waste	77.4	375
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Pretreatment as a 90-day Generator at SRTC followed by Vitrification

SR-W050	Mixed Waste to Support HL Waste Processing Demonstrations	0.1	0.4
SR-W058	Mixed Sludge Waste with Mercury-DWPF Treatability Studies	0.1	0

SRS Canyon Facility - Macroencapsulation in S. S. Container

SR-W009	Silver Coated Packing Material	10.2	3.1
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SRS Facility (TBD) - Macroencapsulation

SR-W015	Mercury Contaminated Equipment	9.8	3.1
SR-W041C	Aqueous Mercury and Lead (Mercury Contaminated Recorder)	0.1	0

SRS Facility (TBD) - Wet Oxidation

SR-W034	Calcium Metal	0.8	0
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SRS Facility (TBD) - Macroencapsulation

SR-W013B	Low-Level Waste Lead (Combined Lead)	86.4	30
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Offsite DOE- Rocky Flats Environmental Technology Site

SR-W053	Rocky Flats Incinerator Ash	0.1	0
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Offsite DOE Facility - INEL/WEDF Amalgamation

SR-W014	Tritiated Mercury	0.3	0.1
SR-W041B	Aqueous Mercury and Lead (Elemental Liquid Mercury)	0.01	0

Offsite DOE Facility - INEL/WEDF Stabilization

SR-W049	Tank E-3-1 Clean Out Material	1.4	0
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Offsite Vendor Facility - Decontamination

SR-W013	Low-Level Waste Lead (Uncombined Elemental Lead)	86.4	30
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Pretreatment by Aging (Undergoing Technical Development)

SR-W036	Radioactive Oil	17.2	7.6
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Macroencapsulation in a Cask, as a 90-Day Generator

SR-W023	Safety/Control Rods	0.3	3.2
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Meet Treatment Standards

SR-W024	Gold Traps	2.3	0.2
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Approved Treatability Variance

SR-W020	In-Tank Precipitation (ITP) Filters	0	16.3
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Waste Streams Consolidated

SR-W019	244-H RBOF High Activity Liquid Waste	0	0
SR-W044	Tributyl Phosphate & n-Paraffin - TRU	0	0
SR-W054	Enriched Uranium Contaminated with Lead	0.1	0

Waste Streams Recharacterized

SR-W021	Poisoned Catalyst Material	0	0
SR-W040	M-Area Stabilized Sludge	0	754
SR-W052	Cadmium Contaminated Glovebox Section	0	0
SR-W057	D-Tested Neutron Generators	0	0

TRU Waste Streams

SR-W006	Mixed TTA/Xylene	0.1	0
SR-W025	Solvent Waste <100 nCi/g TRU **	2791.2	0
SR-W026	Thirde TRU Waste	67	204
SR-W027	Solvent TRU Waste	4955.6	0
SR-W033	Thirde Waste <100 nCi/g TRU Rad **	8.0	25

** Mixed low-level waste conservatively considered as true transuranic waste.

5.3 In-Depth Option Analysis Scoring Summary

Waste Stream No.	Waste Stream Name	Treatment	Facility	Feasible Option	TSF	TSF Y/N	IDOA Total	IDOA Tech.
SR-W009	Silver Coated Packing Material	Stabilization	Vendor	Y	81		66	56
SR-W009	Silver Coated Packing Material	Polymer Encapsulation	Vendor	Y	88		65	55
SR-W009	Silver Coated Packing Material	Stainless Steel Box	Containment Bldg.	Y	51		65	53
SR-W009	Silver Coated Packing Material	Stainless Steel Box	HW/MW	Y	94		62	52
SR-W009	Silver Coated Packing Material	Metathesis	Containment Bldg.	Y	26	N	45	33
SR-W009	Silver Coated Packing Material		CIF	N				
SR-W009	Silver Coated Packing Material		EIF	N				
SR-W009	Silver Coated Packing Material		M-Area	N				
SR-W009	Silver Coated Packing Material	Plasma Arc Cent. Treat.	Vendor	Y	1	N		
SR-W009	Silver Coated Packing Material	Plasma Hearth Process	Vendor	Y	1	N		
SR-W011	Cd Coated Filter Frames	Acid Leach	M-Area Vendor Treatment Process	Y	75		70	57
SR-W011	Cd Coated Filter Frames	Cement Stabilization	Vendor	Y	75		67	58
SR-W011	Cd Coated Filter Frames	Stainless Steel Box	Containment Bldg.	Y	88		68	58
SR-W011	Cd Coated Filter Frames	Polymer Encapsulation	Vendor	Y	100		65	56
SR-W011	Cd Coated Filter Frames	Stainless Steel Box	HW/MW	Y	94		59	58
SR-W011	Cd Coated Filter Frames	Stabilization	INEL/WEDF				65	51
SR-W011	Cd Coated Filter Frames	Plasma Hearth Process	Vendor	Y	1	N		
SR-W011	Cd Coated Filter Frames	Incineration	CIF	N				
SR-W011	Cd Coated Filter Frames	Wastewater Treatment	EIF	N				
SR-W013	LLW Pb	Decontamination	Vendor	Y	88		82	68
SR-W013	LLW Pb	Decontamination	Vendor	Y	88		82	68
SR-W013	Pb	Polymer Encapsulation	Vendor	Y	100		65	57
SR-W013	Pb	Macroencapsulation	Containment Bldg.	Y	75		57	55
SR-W013	Pb	Macroencapsulation	HW/MW	Y	81		53	53
SR-W013	Pb	Stabilization	INEL/WEDF				59	51
SR-W013	Pb	Decon	Cont. Bldg. - 299H	Y	51		52	51
SR-W013	Pb	Macroencapsulation	INEL/WEDF				54	46
SR-W013	Pb		CIF	N				
SR-W013	Pb			N				
SR-W013	Pb		M-Area	N				
SR-W013	Pb	Mineralization	Vendor	Y	26	N		
SR-W014	Tritiated Hg	Distill/Reuse	Containment Bldg.	Y	51		60	50
SR-W014	Tritiated Hg	Distill/Amal	Containment Bldg.	Y	51		53	44
SR-W014	Tritiated Hg	Amalgamation	INEL/WEDF				65	51
SR-W014	Tritiated Hg	Amalgamation	HW/MW	Y	51		50	44
SR-W014	Tritiated Hg		CIF	N				
SR-W014	Tritiated Hg			N				
SR-W014	Tritiated Hg		M-Area	N				
SR-W014	Tritiated Hg		Vendor	N				
SR-W015	Hg Contaminated Equipment	Stainless Steel Box	Containment Bldg.	Y	88		69	57
SR-W015	Hg Contaminated Equipment	Stainless Steel Box	HW/MW	Y	94		65	56
SR-W015	Hg Contaminated Equipment	Roasting and Retorting	Containment Bldg.	Y	51		51	45
SR-W015	Hg Contaminated Equipment		CIF	N				
SR-W015	Hg Contaminated Equipment			N				
SR-W015	Hg Contaminated Equipment		M-Area	N				
SR-W015	Hg Contaminated Equipment		Vendor	N				

Waste Stream No.	Waste Stream Name	Treatment	Facility	Feasible Option	TSF	TSF Y/N	IDOA Total	IDOA Tech.
SR-W018	Filter Paper Rolls	Vitrification	M-Area Vendor Treatment Process	Y	75		70	57
SR-W018	Filter Paper Rolls	Stainless Steel Box	Containment Bldg.	Y	100		66	58
SR-W018	Filter Paper Rolls	Ashcrete Stabilization	CIF	Y	88		62	55
SR-W018	Filter Paper Rolls	Stabilization	INEL/WEDF				63	51
SR-W018	Filter Paper Rolls	Wastewater Treatment		N				
SR-W018	Filter Paper Rolls	Plasma Hearth Process	Vendor	Y	1	N		
SR-W018	Filter Paper Rolls – Debris	Stainless Steel Box	HW/MW	Y	100		63	57
SR-W018	Filter Paper Rolls	Incineration	CIF	Y	94		71	60
SR-W028	Mk 15 Filter Paper Rolls	Vitrification	M-Area Vendor Treatment Process	Y	75		74	60
SR-W028	Mk 15 Filter Paper Rolls	Incineration	CIF	Y	94		74	60
SR-W028	Mk 15 Filter Paper Rolls	Ashcrete Stabilization	CIF	Y	88		71	57
SR-W028	Mk 15 Filter Paper Rolls	Stainless Steel Box	Containment Bldg.	Y	100		72	58
SR-W028	Mk 15 Filter Paper Rolls	Stainless Steel Box	HW/MW	Y	100		72	58
SR-W028	Mk 15 Filter Paper Rolls	Stabilization	INEL/WEDF				65	51
SR-W028	Mk 15 Filter Paper Rolls	Wastewater Treatment		N				
SR-W028	Mk 15 Filter Paper Rolls	Plasma Arc Cent. Treat.	Vendor	Y	1	N		
SR-W028	Mk 15 Filter Paper Rolls	Plasma Hearth Process	Vendor	Y	1	N		
SR-W031	Uranium/Chromium Solution	Vitrification	M-Area Vendor	Y	100		75	61
SR-W031	Uranium/Chromium Solution	Polymer Emulsification	Vendor	Y	88		73	59
SR-W031	Uranium/Chromium Solution	Cement Stabilization	Vendor	Y	75		72	58
SR-W031	Uranium/Chromium Solution	Stabilization In Ashcrete	CIF	Y	88		71	58
SR-W031	Uranium/Chromium Solution	In-Drum Stabilization	Containment Bldg.	Y	51		65	51
SR-W031	Uranium/Chromium Solution	Stabilization	INEL/WEDF				65	51
SR-W031	Uranium/Chromium Solution	Wastewater Treatment		N				
SR-W031	Uranium/Chromium Solution		Planned/Other	N				
SR-W034	Ca Metal	Water Oxidation	Containment Bldg.	Y	51		82	69
SR-W034	Ca Metal	React To CaCO ₃	Vendor	Y	100		79	66
SR-W034	Ca Metal	Acid Dissolution	M-Area DETF	Y	88		77	64
SR-W034	Ca Metal	Stabilization	INEL/WEDF				65	51
SR-W034	Ca Metal	Incineration	CIF	N				
SR-W034	Ca Metal	Wastewater Treatment		N				
SR-W034	Ca Metal		Planned/Other	N				
SR-W034	Ca Metal	Vitrification	Vendor	Y	26	N		
SR-W034	Ca Metal	Plasma Hearth Process	Vendor	Y	1	N		
SR-W036	Radioactive Oil	Thermal Destruction	Vendor	Y	100		83	70
SR-W036	Radioactive Oil	Stabilization	INEL/WEDF				64	51
SR-W036	Radioactive Oil	Incineration	INEL/WERF				89	45
SR-W036	Radioactive Oil	Incineration	CIF	N				
SR-W036	Radioactive Oil		Containment Bldg.	N				
SR-W036	Radioactive Oil	Wastewater Treatment		N				
SR-W036	Radioactive Oil		M-Area	N				
SR-W041A	Aq. Hg & Pb	Ion Exchange		Y	94		79	65
SR-W041A	Aq. Hg & Pb	Cement Stabilization	Vendor	Y	75		73	59
SR-W041A	Aq. Hg & Pb	Polymer Emulsification	Vendor.	Y	88		73	59
SR-W041A	Aq. Hg & Pb	Ashcrete Stabilization	CIF	N				
SR-W041A	Aq. Hg & Pb	In-Drum Stabilization	Containment Bldg..	Y	51		67	54

Waste Stream No.	Waste Stream Name	Treatment	Facility	Feasible Option	TSF	TSF Y/N	IDOA Total	IDOA Tech.
SR-W041A	Aq. Hg & Pb	Precipitation	Vendor	Y	88		57	45
SR-W041A	Aq. Hg & Pb	Stabilization	INEL/WEDF				65	51
SR-W041A	Aq. Hg & Pb		CIF	N				
SR-W041A	Aq. Hg & Pb		Planned/Other	N				
SR-W041A	Aq. Hg & Pb	Vitrification	M-Area Vendor Treatment Process	N				
SR-W041B	Elemental Hg	Amalgamation	INEL/WEDF				51	65
SR-W041B	Elemental Hg	Distill/Reuse	Containment Bldg.	Y	51		62	51
SR-W041B	Elemental Hg	Distill/Amalgamate	Containment Bldg.	Y	51		56	46
SR-W041B	Elemental Hg	Amalgamation	HW/MW	Y	51		40	33
SR-W041B	Elemental Hg	Ashcrete Stabilization	CIF	N				
SR-W041B	Elemental Hg	Wastewater Treatment		N				
SR-W041B	Elemental Hg		M-Area	N				
SR-W041B	Elemental Hg		Vendor	N				
SR-W041C	Hg Cont. Recorder – Debris	Stainless Steel Box	HW/MW	Y	100		72	58
SR-W041C	Hg Cont. Recorder – Debris	Stainless Steel Box	Containment Bldg.	Y	88		72	58
SR-W041C	Hg Cont. Recorder – Debris	Roast and Retort	Containment Bldg.	N				
SR-W041C	Hg Cont. Recorder – Debris	Incineration	CIF	N				
SR-W041C	Hg Cont. Recorder – Debris	Wastewater Treatment		N				
SR-W041C	Hg Cont. Recorder – Debris		M-Area	N				
SR-W041C	Hg Cont. Recorder – Debris		Vendor	N				
SR-W042	Paints and Thinners	Incineration	CIF	Y	94		75	63
SR-W042	Paints and Thinners	Stabilization	INEL/WEDF				65	51
SR-W042	Paints and Thinners	Incineration	INEL/WERF				59	45
SR-W042	Paints and Thinners		Containment Bldg.	N				
SR-W042	Paints and Thinners	Wastewater Treatment		N				
SR-W042	Paints and Thinners		M-Area	N				
SR-W042	Paints and Thinners		Planned/Other	N				
SR-W042	Paints and Thinners		Vendor	N				
SR-W043	Lab Waste w/TPB	Incineration	CIF	Y	94		77	64
SR-W043	Lab Waste w/TPB	Stabilization	INEL/WEDF				65	51
SR-W043	Lab Waste w/TPB	Incineration	INEL/WERF				59	45
SR-W043	Lab Waste w/TPB		Containment Bldg.	N				
SR-W043	Lab Waste w/TPB	Wastewater Treatment		N				
SR-W043	Lab Waste w/TPB		M-Area	N				
SR-W043	Lab Waste w/TPB		Planned/Other	N				
SR-W043	Lab Waste w/TPB		Vendor	N				
SR-W045	TBP and n-Paraffin	Incineration	CIF	Y	94		78	64
SR-W045	TBP and n-Paraffin		Containment Bldg.	N				
SR-W045	TBP and n-Paraffin	Wastewater Treatment		N				
SR-W045	TBP and n-Paraffin		M-Area	N				
SR-W045	TBP and n-Paraffin		Planned/Other	N				
SR-W045	TBP and n-Paraffin	Bed Combustion	Vendor	Y	13	N		
SR-W045	TBP and n-Paraffin	Thermal Destruction	Vendor	N				
SR-W045	TBP and n-Paraffin	Catalyzed Wet Oxid.	Vendor	Y	1	N		
SR-W045	TBP and n-Paraffin	Pyrolysis	Vendor	Y	1	N		
SR-W047	CIF Blowdown	Wastewater Treat	M-Area LETF	Y	13	N	62	60
SR-W047	CIF Blowdown	Stabilization	CIF	Y	94		60	56

Waste Stream No.	Waste Stream Name	Treatment	Facility	Feasible Option	TSF	TSF Y/N	IDOA Total	IDOA Tech.
SR-W047	CIF Blowdown	Vitrification	M-Area Vendor Treatment Process	Y	38	N	54	54
SR-W047	CIF Blowdown		Containment Bldg.	N				
SR-W047	CIF Blowdown	Wastewater Treatment		N				
SR-W047	CIF Blowdown		Planned/Other	N				
SR-W047	CIF Blowdown		Vendor	N				
SR-W048	Contaminated Soil	Vitrification	M-Area Vendor Treatment Process	Y	63		71	59
SR-W048	Contaminated Soil	Polymer Encapsulation	Vendor	Y	100		67	57
SR-W048	Contaminated Soil	Cement Stabilization	Vendor	Y	75		67	61
SR-W048	Contaminated Soil	Soil Washing	Vendor	Y	75		67	61
SR-W048	Contaminated Soil	Chelation	Vendor	Y	81		56	47
SR-W048	Contaminated Soil	Soil Washing	HW/MW	Y	51		48	48
SR-W048	Contaminated Soil	Incineration	INEL IWPF				49	35
SR-W048	Contaminated Soil	Metal Migration	Containment Bldg.	Y	26	N		
SR-W048	Contaminated Soil			N				
SR-W048	Contaminated Soil	Plasma Arc Remediation	Vendor.	N	1	N		
SR-W048	Contaminated Soil	Plasma Hearth Process	Vendor	Y	1	N		
SR-W048	Contaminated Soil	Vitrification	Vendor	Y	38	N		
SR-W048	Contaminated Soil	Incineration	CIF	N				
SR-W049	Tank E-3-1 Clean-Out Mat'l.	Soil Washing	HW/MW	Y	51		62	48
SR-W049	Tank E-3-1 Clean-Out Mat'l.	Ash Stabilization	CIF	Y	75		63	52
SR-W049	Tank E-3-1 Clean-Out Mat'l.	Stabilization	INEL/WEDF				65	51
SR-W049	Tank E-3-1 Clean-Out Mat'l.	Metal Migration	Containment Bldg.	Y	26	N		
SR-W049	Tank E-3-1 Clean-Out Mat'l.			N				
SR-W049	Tank E-3-1 Clean-Out Mat'l.		M-Area	N				
SR-W049	Tank E-3-1 Clean-Out Mat'l.		Vendor	N				
SR-W051	Spent Filter Cartridges	Incineration	CIF	Y	94		74	61
SR-W051	Spent Filter Cartridges	Polymer Encapsulation	Vendor	Y	100		73	59
SR-W051	Spent Filter Cartridges	Stainless Steel Box	HW/MW	Y	100		72	58
SR-W051	Spent Filter Cartridges	Stainless Steel Box	Containment Bldg.	Y	94		72	58
SR-W051	Spent Filter Cartridges	Incineration	INEL/WERF				61	47
SR-W051	Spent Filter Cartridges	Vitrification	M-Area Vendor Treatment Process	N				
SR-W051	Spent Filter Cartridges	Acid Leach	Containment Bldg.	Y	32	N		
SR-W051	Spent Filter Cartridges	Wastewater Treatment		N				
SR-W051	Spent Filter Cartridges	Plasma Hearth Process	Vendor	Y	1	N		
SR-W053	Rocky Flats Incinerator Ash	Ash Stabilization	CIF	Y	88		68	55
SR-W053	Rocky Flats Incinerator Ash	Return To Rocky Flats	Other DOE - Ship Back	Y	100		90	76
SR-W053	Rocky Flats Incinerator Ash		Containment Bldg.	N				
SR-W053	Rocky Flats Incinerator Ash			N				
SR-W053	Rocky Flats Incinerator Ash	Stabilization	HW/MW	N				
SR-W053	Rocky Flats Incinerator Ash		M-Area	N				
SR-W053	Rocky Flats Incinerator Ash		Vendor	N				
SR-W055	Job Waste w/Solvents	Incineration	CIF	Y	94		71	62
SR-W055	Job Waste w/Solvents	Stabilization	INEL/WEDF				53	51
SR-W055	Job Waste w/Solvents	Incineration	INEL/WERF				47	45
SR-W055	Job Waste w/Solvents	Incineration	INEL/IWPF				37	35

Waste Stream No.	Waste Stream Name	Treatment	Facility	Feasible Option	TSF	TSF Y/N	IDOA Total	IDOA Tech.
SR-W055	Job Waste w/Solvents		Containment Bldg.	N				
SR-W055	Job Waste w/Solvents			N				
SR-W055	Job Waste w/Solvents		M-Area	N				
SR-W055	Job Waste w/Solvents		Planned/Other	N				
SR-W055	Job Waste w/Solvents		Vendor	N				
SR-W056	Job Waste w/Solvents & EU	Incineration	CIF	Y	94		76	62
SR-W056	Job Waste w/Solvents & EU	Stabilization	INEL/WEDF				64	51
SR-W056	Job Waste w/Solvents & EU	Incineration	INEL/WERF				58	45
SR-W056	Job Waste w/Solvents & EU		Containment Bldg.	N				
SR-W056	Job Waste w/Solvents & EU			N				
SR-W056	Job Waste w/Solvents & EU		M-Area	N				
SR-W056	Job Waste w/Solvents & EU		Planned/Other	N				
SR-W056	Job Waste w/Solvents & EU		Vendor	N				
SR-W059	Tetrabutyl Titanate	Incineration	CIF	Y	94		79	66
SR-W059	Tetrabutyl Titanate	TSCA Incinerator	Oak Ridge				61	48
SR-W059	Tetrabutyl Titanate	Air Sparge	Containment Bldg.	Y	26	N		
SR-W059	Tetrabutyl Titanate			N				
SR-W059	Tetrabutyl Titanate		M-Area	N				
SR-W059	Tetrabutyl Titanate		Planned/Other	N				
SR-W059	Tetrabutyl Titanate		Vendor	N				

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6.0 ABBREVIATIONS AND ACRONYMS

– A –

ADGAS	Venting of compressed gases into an absorbing or reacting media
Ag	Silver
ALARA	As Low As Reasonably Achievable
Am	Americium
AMALG	Amalgamation
As	Arsenic

– B –

B/D	Blowdown
Ba	Barium
BDAT	Best Demonstrated Available Technology
BOD	Biological Oxygen Demand
Br	Bromine
BTU	British Thermal Unit

– C –

C	Carbon
CB	Containment Building
Cd	Cadmium
Ce	Cerium
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
Cf	Consequence of Failure
CFR	Code of Federal Regulations
Chem	Chemical
CHOXD	Chemical or Electrolytic Oxidation
CHRED	Chemical Reduction
Ci	Curie
CIF	Consolidated Incineration Facility
Cm	Curium
Co	Cobalt
CO ₂	Carbon Dioxide
Cont. Bldg.	Containment Building
Cr	Chromium
Cs	Cesium
CSTP	Conceptual Site Treatment Plan
CTF	Chemical Transfer Facility

- D -

D&D	Decontamination and Decommissioning
DEACT	Deactivation
Decon	Decontamination
Dest	Destruction (Thermal Destruction)
DETF	Dilute Effluent Treatment Facility
DF	Disposal Facility
Distill	Distillation
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DSTP	Draft Site Treatment Plan
DWPF	Defense Waste Processing Facility

- E -

EA	Environmental Assessment
EAV	E-Area Vaults
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ER	Environmental Restoration
ETF	Effluent Treatment Facility
EU	Enriched Uranium
Eu	Europium

- F -

FBC	Fluidized Bed Combustion
FFCA	Federal Facility Compliance Agreement
FFCAct	Federal Facility Compliance Act
FONSI	Finding of No Significant Impact
FP	Filter Paper
FPR	Functional Performance Requirements
FPTUR	Filter Paper Take-Up Rolls
FR	Federal Register
FSTP	Final Site Treatment Plan
FSUBS	Fuel Substitution
FY	Fiscal Year

- G -

g or gm	Gram
GAC	Granular Activated Carbon
GAO	Government Accounting Office

GOCO Government Owned Contractor Operated

– H –

H	Hydrogen
H ³	Tritium
HEPA	High Efficiency Particulate Air
Hg	Mercury
HLLW	High Level Liquid Waste
HLW	High-Level Waste
HW/MW	Hazardous Waste/Mixed Waste
HW/MW DV	Hazardous Waste/Mixed Waste Disposal Vaults
HW/MW-TB	Hazardous Waste/Mixed Waste Treatment Building

– I –

I	Iodine
ICP	Ion Column Partitioning
ICPP	Idaho Chemical Processing Plant
IDOA	In-Depth Options Analysis
IDW	Investigation Derived Waste
INCIN	Incineration
INEL	Idaho National Engineering Laboratory
ITP	In-Tank Precipitation
IWPF	Idaho Waste Processing Facility
IWT	Interim Waste Technology

– J –

JCW Job Control Wastes

– K –

K	Potassium
kg	Kilogram

– L –

L	Liter
LAW	Low Activity Waste
LDR	Land Disposal Restrictions
LETF	Liquid Effluent Treatment Facility
LLNL	Lawrence Livermore National Laboratory
LLW	Low-Level Waste

- M -

m	Meter
MACRO	Macroencapsulation
MGD	Million gallons/day
Mil	Million
MLLW	Mixed Low-Level Waste
mm	Millimeter
MSDS	Material Safety Data Sheet
MWIR	Mixed Waste Inventory Report
MWST	Mixed Waste Storage Tanks

- N -

N	Nitrogen
Na	Sodium
Nb	Niobium
NDA	Non-Destructive Analysis
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NEUTR	Neutralization
Ni	Nickel
NPDES	National Pollution Discharge Elimination System
NPV	Net Present Value
NRC	Nuclear Regulatory Commission
NWW	Non wastewater

- O -

O	Oxygen
O&M	Operations and Maintenance
ORR	Operational Readiness Review
OWST	Organic Waste Storage Tank
Ox	Oxidation

- P -

P	Phosphorus
PAC	Powdered Activated Carbon
Pb	Lead
Pc	Complexity Factor
PCC	Primary Combustion Chamber
Pf	Probability Factor
Pm	Maturity Factor
Pm	Promethium

PO	Preferred Option
PPE	Personal Protective Equipment
ppm	Parts Per Million
ppt	Parts Per Trillion
Pr	Praseodymium
Pre-Op	Pre-Operational
Precip	Precipitation
Pu	Plutonium
Pu Sep	Plutonium Separation
PUREX	Plutonium Uranium Extraction
PVC	Polyvinyl Chloride
PWIT	Process Waste Interim Treatment
PWIT/SF	Process Waste Interim Treatment/Storage Facility
Pyrol	Pyrolysis

- Q -

QA	Quality Assurance
QC	Quality Control

- R -

R&D	Research and Development
R&R	Roast/Retort
Rad	Radiation
RBOF	Receiving Basin for Offsite Fuel
RMMA	Radiologically Controlled Area
RCRA	Resource Conservation and Recovery Act
React	Reaction
RF	Risk Factor
RFP	Request For Proposal
Rh	Rhodium
RMETL	Recovery of metals or inorganics
RO	Reverse Osmosis
ROD	Record of Decision
RTHRM	Thermal recovery of metals or inorganics
RTR	Real Time Radiography
Ru	Ruthenium

- S -

S.S.	Stainless Steel
SAA	Satellite Accumulation Area
SAR	Safety Analysis Report
Sb	Antimony

Sc	Scandium
SCC	Secondary Combustion Chamber
SCDHEC	South Carolina Department of Health and Environmental Control
Se	Selenium
SNM	Special Nuclear Material
Sr	Strontium
SR-WXXX	Savannah River -- Waste XXX
SRL	Savannah River Laboratory (old reference)
SRS	Savannah River Site
SRTC	Savannah River Technology Center (previously known as Savannah River Laboratory)
Stab	Stabilization
STABL	Stabilization
STP	Site Treatment Plan

- T -

TAC	Technical Advisory Committee
TB	Treatment Building
TBD	To Be Determined
TBT	Tetrabutyl Titanate
TCLP	Toxicity Characteristic Leaching Procedure
Te	Technetium
TEC	Total Estimated Cost
Thermal Dest	Thermal Destruction
TOC	Total Organic Carbon
TOSCA	Toxic Substance Control Act
TOSCA	Toxic Substance Control Act
TPB	Tetraphenyl borate
TRU	Transuranic
TSF	Technology Success Factor
TSS	Total Suspended Solids
TTA	Thermoyl Trifluoroacetone

- U -

U	Uranium
USQ	Unresolved Safety Question
UV	Ultraviolet

- V -

VES	Vinyl Ester Styrene
Vol	Volume

– W –

WAC	Waste Acceptance Criteria
WBS	Work Breakdown Structure
WEDF	Waste Engineering Development Facility
WERF	Waste Experimental Reduction Facility
WIPP	Waste Isolation Pilot Plant
WITS	Waste Information Tracking System
WSRC	Westinghouse Savannah River Company
Wt	Weight
WW	Wastewater
WWT	Wastewater Treatment
WWTF	Wastewater Treatment Facility

– X –

– Y –

– Z –

Zr Zirconium

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