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U.S. DEPARTMENT OF ENERGY INTERIM MIXED WASTE INVENTORY REPORT: WASTE STREAMS, TREATMENT CAPACITIES AND TECHNOLOGIES VOLUME 6: APPENDICES APRIL 1993

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U.S. Department of Energy Interim Mixed Waste Inventory Report: Waste Streams, Treatment Capacities and Technologies

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U.S. Department of Energy
Interim Mixed Waste Inventory Report: Waste Streams, Treatment Capacities and Technologies

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APPENDIX A

Federal Facility Compliance

Act of 1992

October 6, 1992

Public Law 102-386
102d Congress

An Act

To amend the Solid Waste Disposal Act to clarify provisions concerning the application of certain requirements and sanctions to Federal facilities.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

TITLE I—FEDERAL FACILITY COMPLIANCE ACT

SEC. 101. SHORT TITLE.

This title may be cited as the "Federal Facility Compliance Act of 1992".

SEC. 102. APPLICATION OF CERTAIN PROVISIONS TO FEDERAL FACILITIES.

(a) IN GENERAL.—Section 6001 of the Solid Waste Disposal Act (42 U.S.C. 6961) is amended—

(1) by inserting "(a) IN GENERAL.—" after "6001.";

(2) in the first sentence, by inserting "and management" before "in the same manner";

(3) by inserting after the first sentence the following: "The Federal, State, interstate, and local substantive and procedural requirements referred to in this subsection include, but are not limited to, all administrative orders and all civil and administrative penalties and fines, regardless of whether such penalties or fines are punitive or coercive in nature or are imposed for isolated, intermittent, or continuing violations. The United States hereby expressly waives any immunity otherwise applicable to the United States with respect to any such substantive or procedural requirement (including, but not limited to, any injunctive relief, administrative order or civil or administrative penalty or fine referred to in the preceding sentence, or reasonable service charge). The reasonable service charges referred to in this subsection include, but are not limited to, fees or charges assessed in connection with the processing and issuance of permits, renewal of permits, amendments to permits, review of plans, studies, and other documents, and inspection and monitoring of facilities, as well as any other nondiscriminatory charges that are assessed in connection with a Federal, State, interstate, or local solid waste or hazardous waste regulatory program."; and

(4) by inserting after the second sentence the following: "No agent, employee, or officer of the United States shall be personally liable for any civil penalty under any Federal, State, interstate, or local solid or hazardous waste law with respect to any act or omission within the scope of the official duties of the agent, employee, or officer. An agent, employee, or officer of the United States shall be subject to any criminal sanction

(including, but not limited to, any fine or imprisonment) under any Federal or State solid or hazardous waste law, but no department, agency, or instrumentality of the executive, legislative, or judicial branch of the Federal Government shall be subject to any such sanction.".

(b) ADMINISTRATIVE ENFORCEMENT ACTIONS.—Such section is further amended by adding at the end the following new subsections:

"(b) ADMINISTRATIVE ENFORCEMENT ACTIONS.—(1) The Administrator may commence an administrative enforcement action against any department, agency, or instrumentality of the executive, legislative, or judicial branch of the Federal Government pursuant to the enforcement authorities contained in this Act. The Administrator shall initiate an administrative enforcement action against such a department, agency, or instrumentality in the same manner and under the same circumstances as an action would be initiated against another person. Any voluntary resolution or settlement of such an action shall be set forth in a consent order.

"(2) No administrative order issued to such a department, agency, or instrumentality shall become final until such department, agency, or instrumentality has had the opportunity to confer with the Administrator.

"(c) LIMITATION ON STATE USE OF FUNDS COLLECTED FROM FEDERAL GOVERNMENT.—Unless a State law in effect on the date of the enactment of the Federal Facility Compliance Act of 1992 or a State constitution requires the funds to be used in a different manner, all funds collected by a State from the Federal Government from penalties and fines imposed for violation of any substantive or procedural requirement referred to in subsection (a) shall be used by the State only for projects designed to improve or protect the environment or to defray the costs of environmental protection or enforcement.".

(c) EFFECTIVE DATES.—

(1) IN GENERAL.—Except as otherwise provided in paragraphs (2) and (3), the amendments made by subsection (a) shall take effect upon the date of the enactment of this Act.

(2) DELAYED EFFECTIVE DATE FOR CERTAIN MIXED WASTE.—Until the date that is 3 years after the date of the enactment of this Act, the waiver of sovereign immunity contained in section 6001(a) of the Solid Waste Disposal Act with respect to civil, criminal, and administrative penalties and fines (as added by the amendments made by subsection (a)) shall not apply to departments, agencies, and instrumentalities of the executive branch of the Federal Government for violations of section 3004(j) of the Solid Waste Disposal Act involving storage of mixed waste that is not subject to an existing agreement, permit, or administrative or judicial order, so long as such waste is managed in compliance with all other applicable requirements.

(3) EFFECTIVE DATE FOR CERTAIN MIXED WASTE.—(A) Except as provided in subparagraph (B), after the date that is 3 years after the date of the enactment of this Act, the waiver of sovereign immunity contained in section 6001(a) of the Solid Waste Disposal Act with respect to civil, criminal, and administrative penalties and fines (as added by the amendments made by subsection (a)) shall apply to departments, agencies, and instrumentalities of the executive branch of the Federal Govern-

ment for violations of section 3004(j) of the Solid Waste Disposal Act involving storage of mixed waste.

(B) With respect to the Department of Energy, the waiver of sovereign immunity referred to in subparagraph (A) shall not apply after the date that is 3 years after the date of the enactment of this Act for violations of section 3004(j) of such Act involving storage of mixed waste, so long as the Department of Energy is in compliance with both—

(i) a plan that has been submitted and approved pursuant to section 3021(b) of the Solid Waste Disposal Act and which is in effect; and

(ii) an order requiring compliance with such plan which has been issued pursuant to such section 3021(b) and which is in effect.

(4) APPLICATION OF WAIVER TO AGREEMENTS AND ORDERS.—The waiver of sovereign immunity contained in section 6001(a) of the Solid Waste Disposal Act (as added by the amendments made by subsection (a)) shall take effect on the date of the enactment of this Act with respect to any agreement, permit, or administrative or judicial order existing on such date of enactment (and any subsequent modifications to such an agreement, permit, or order), including, without limitation, any provision of an agreement, permit, or order that addresses compliance with section 3004(j) of such Act with respect to mixed waste.

(5) AGREEMENT OR ORDER.—Except as provided in paragraph (4), nothing in this Act shall be construed to alter, modify, or change in any manner any agreement, permit, or administrative or judicial order, including, without limitation, any provision of an agreement, permit, or order—

(i) that addresses compliance with section 3004(j) of the Solid Waste Disposal Act with respect to mixed waste;

(ii) that is in effect on the date of enactment of this Act; and

(iii) to which a department, agency, or instrumentality of the executive branch of the Federal Government is a party.

SEC. 103. DEFINITION OF PERSON.

Section 1004(15) of the Solid Waste Disposal Act (42 U.S.C. 6903(15)) is amended by adding the following before the period: "and shall include each department, agency, and instrumentality of the United States".

SEC. 104. FACILITY ENVIRONMENTAL ASSESSMENTS.

Section 3007(c) of the Solid Waste Disposal Act (42 U.S.C. 6927(c)) is amended as follows:

(1) The first sentence is amended by striking out "Beginning" and all that follows through "undertake" and inserting in lieu thereof "The Administrator shall undertake".

(2) The first sentence is further amended by striking out "Federal agency" and inserting in lieu thereof "department, agency, or instrumentality of the United States".

(3) The section is further amended by inserting after the first sentence the following new sentence: "Any State with an authorized hazardous waste program also may conduct an inspection of any such facility for purposes of enforcing the facility's compliance with the State hazardous waste program.".

(4) The section is further amended by adding at the end the following: "The department, agency, or instrumentality owning or operating each such facility shall reimburse the Environmental Protection Agency for the costs of the inspection of the facility. With respect to the first inspection of each such facility occurring after the date of the enactment of the Federal Facility Compliance Act of 1992, the Administrator shall conduct a comprehensive ground water monitoring evaluation at the facility, unless such an evaluation was conducted during the 12-month period preceding such date of enactment.".

SEC. 105. MIXED WASTE INVENTORY REPORTS AND PLAN.

(a) MIXED WASTE AMENDMENT.—(1) Subtitle C of the Solid Waste Disposal Act (42 U.S.C. 6921 et seq.) is amended by adding at the end the following new section:

"SEC. 3021. MIXED WASTE INVENTORY REPORTS AND PLAN.

"(a) MIXED WASTE INVENTORY REPORTS.—

"(1) REQUIREMENT.—Not later than 180 days after the date of the enactment of the Federal Facility Compliance Act of 1992, the Secretary of Energy shall submit to the Administrator and to the Governor of each State in which the Department of Energy stores or generates mixed wastes the following reports:

"(A) A report containing a national inventory of all such mixed wastes, regardless of the time they were generated, on a State-by-State basis.

"(B) A report containing a national inventory of mixed waste treatment capacities and technologies.

"(2) INVENTORY OF WASTES.— The report required by paragraph (1)(A) shall include the following:

"(A) A description of each type of mixed waste at each Department of Energy facility in each State, including, at a minimum, the name of the waste stream.

"(B) The amount of each type of mixed waste currently stored at each Department of Energy facility in each State, set forth separately by mixed waste that is subject to the land disposal prohibition requirements of section 3004 and mixed waste that is not subject to such prohibition requirements.

"(C) An estimate of the amount of each type of mixed waste the Department expects to generate in the next 5 years at each Department of Energy facility in each State.

"(D) A description of any waste minimization actions the Department has implemented at each Department of Energy facility in each State for each mixed waste stream.

"(E) The EPA hazardous waste code for each type of mixed waste containing waste that has been characterized at each Department of Energy facility in each State.

"(F) An inventory of each type of waste that has not been characterized by sampling and analysis at each Department of Energy facility in each State.

"(G) The basis for the Department's determination of the applicable hazardous waste code for each type of mixed waste at each Department of Energy facility and a description of whether the determination is based on sampling

and analysis conducted on the waste or on the basis of process knowledge.

"(H) A description of the source of each type of mixed waste at each Department of Energy facility in each State.

"(I) The land disposal prohibition treatment technology or technologies specified for the hazardous waste component of each type of mixed waste at each Department of Energy facility in each State.

"(J) A statement of whether and how the radionuclide content of the waste alters or affects use of the technologies described in subparagraph (I).

"(3) INVENTORY OF TREATMENT CAPACITIES AND TECHNOLOGIES.—The report required by paragraph (1)(B) shall include the following:

"(A) An estimate of the available treatment capacity for each waste described in the report required by paragraph (1)(A) for which treatment technologies exist.

"(B) A description, including the capacity, number and location, of each treatment unit considered in calculating the estimate under subparagraph (A).

"(C) A description, including the capacity, number and location, of any existing treatment unit that was not considered in calculating the estimate under subparagraph (A) but that could, alone or in conjunction with other treatment units, be used to treat any of the wastes described in the report required by paragraph (1)(A) to meet the requirements of regulations promulgated pursuant to section 3004(m).

"(D) For each unit listed in subparagraph (C), a statement of the reasons why the unit was not included in calculating the estimate under subparagraph (A).

"(E) A description, including the capacity, number, location, and estimated date of availability, of each treatment unit currently proposed to increase the treatment capacities estimated under subparagraph (A).

"(F) For each waste described in the report required by paragraph (1)(A) for which the Department has determined no treatment technology exists, information sufficient to support such determination and a description of the technological approaches the Department anticipates will need to be developed to treat the waste.

"(4) COMMENTS AND REVISIONS.—Not later than 90 days after the date of the submission of the reports by the Secretary of Energy under paragraph (1), the Administrator and each State which received the reports shall submit any comments they may have concerning the reports to the Department of Energy. The Secretary of Energy shall consider and publish the comments prior to publication of the final report.

"(5) REQUESTS FOR ADDITIONAL INFORMATION.—Nothing in this subsection limits or restricts the authority of States or the Administrator to request additional information from the Secretary of Energy.

"(b) PLAN FOR DEVELOPMENT OF TREATMENT CAPACITIES AND TECHNOLOGIES.—

"(1) PLAN REQUIREMENT.—(A)(i) For each facility at which the Department of Energy generates or stores mixed wastes, except any facility subject to a permit, agreement, or order

described in clause (ii), the Secretary of Energy shall develop and submit, as provided in paragraph (2), a plan for developing treatment capacities and technologies to treat all of the facility's mixed wastes, regardless of the time they were generated, to the standards promulgated pursuant to section 3004(m).

"(ii) Clause (i) shall not apply with respect to any facility subject to any permit establishing a schedule for treatment of such wastes, or any existing agreement or administrative or judicial order governing the treatment of such wastes, to which the State is a party.

"(B) Each plan shall contain the following:

"(i) For mixed wastes for which treatment technologies exist, a schedule for submitting all applicable permit applications, entering into contracts, initiating construction, conducting systems testing, commencing operations, and processing backlogged and currently generated mixed wastes.

"(ii) For mixed wastes for which no treatment technologies exist, a schedule for identifying and developing such technologies, identifying the funding requirements for the identification and development of such technologies, submitting treatability study exemptions, and submitting research and development permit applications.

"(iii) For all cases where the Department proposes radionuclide separation of mixed wastes, or materials derived from mixed wastes, it shall provide an estimate of the volume of waste generated by each case of radionuclide separation, the volume of waste that would exist or be generated without radionuclide separation, the estimated costs of waste treatment and disposal if radionuclide separation is used compared to the estimated costs if it is not used, and the assumptions underlying such waste volume and cost estimates.

"(C) A plan required under this subsection may provide for centralized, regional, or on-site treatment of mixed wastes, or any combination thereof.

"(2) REVIEW AND APPROVAL OF PLAN.—(A) For each facility that is located in a State (i) with authority under State law to prohibit land disposal of mixed waste until the waste has been treated and (ii) with both authority under State law to regulate the hazardous components of mixed waste and authorization from the Environmental Protection Agency under section 3006 to regulate the hazardous components of mixed waste, the Secretary of Energy shall submit the plan required under paragraph (1) to the appropriate State regulatory officials for their review and approval, modification, or disapproval. In reviewing the plan, the State shall consider the need for regional treatment facilities. The State shall consult with the Administrator and any other State in which a facility affected by the plan is located and consider public comments in making its determination on the plan. The State shall approve, approve with modifications, or disapprove the plan within 6 months after receipt of the plan.

"(B) For each facility located in a State that does not have the authority described in subparagraph (A), the Secretary shall submit the plan required under paragraph (1) to the Administrator of the Environmental Protection Agency for

review and approval, modification, or disapproval. A copy of the plan also shall be provided by the Secretary to the State in which such facility is located. In reviewing the plan, the Administrator shall consider the need for regional treatment facilities. The Administrator shall consult with the State or States in which any facility affected by the plan is located and consider public comments in making a determination on the plan. The Administrator shall approve, approve with modifications, or disapprove the plan within 6 months after receipt of the plan.

"(C) Upon the approval of a plan under this paragraph by the Administrator or a State, the Administrator shall issue an order under section 3008(a), or the State shall issue an order under appropriate State authority, requiring compliance with the approved plan.

"(3) PUBLIC PARTICIPATION.—Upon submission of a plan by the Secretary of Energy to the Administrator or a State, and before approval of the plan by the Administrator or a State, the Administrator or State shall publish a notice of the availability of the submitted plan and make such submitted plan available to the public on request.

"(4) REVISIONS OF PLAN.—If any revisions of an approved plan are proposed by the Secretary of Energy or required by the Administrator or a State, the provisions of paragraphs (2) and (3) shall apply to the revisions in the same manner as they apply to the original plan.

"(5) WAIVER OF PLAN REQUIREMENT.—(A) A State may waive the requirement for the Secretary of Energy to develop and submit a plan under this subsection for a facility located in the State if the State (i) enters into an agreement with the Secretary of Energy that addresses compliance at that facility with section 3004(j) with respect to mixed waste, and (ii) issues an order requiring compliance with such agreement and which is in effect.

"(B) Any violation of an agreement or order referred to in subparagraph (A) is subject to the waiver of sovereign immunity contained in section 6001(a).

"(c) SCHEDULE AND PROGRESS REPORTS.—

"(1) SCHEDULE.—Not later than 6 months after the date of the enactment of the Federal Facility Compliance Act of 1992, the Secretary of Energy shall publish in the Federal Register a schedule for submitting the plans required under subsection (b).

"(2) PROGRESS REPORTS.—(A) Not later than the deadlines specified in subparagraph (B), the Secretary of Energy shall submit to the Committee on Environment and Public Works of the Senate and the Committee on Energy and Commerce of the House of Representatives a progress report containing the following:

"(i) An identification, by facility, of the plans that have been submitted to States or the Administrator of the Environmental Protection Agency pursuant to subsection (b).

"(ii) The status of State and Environmental Protection Agency review and approval of each such plan.

"(iii) The number of orders requiring compliance with such plans that are in effect.

"(iv) For the first 2 reports required under this paragraph, an identification of the plans required under such subsection (b) that the Secretary expects to submit in the 12-month period following submission of the report.

"(B) The Secretary of Energy shall submit a report under subparagraph (A) not later than 12 months after the date of the enactment of the Federal Facility Compliance Act of 1992, 24 months after such date, and 36 months after such date.".

(2) The table of contents for subtitle C of the Solid Waste Disposal Act (contained in section 1001) is amended by adding at the end the following new item:

"Sec. 3021. Mixed waste inventory reports and plan.".

(b) DEFINITION.—Section 1004 of the Solid Waste Disposal Act (42 U.S.C. 6902) is amended by adding at the end the following new paragraph:

"(41) The term 'mixed waste' means waste that contains both hazardous waste and source, special nuclear, or by-product material subject to the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.).".

(c) GAO REPORT.—

(1) REQUIREMENT.—Not later than 18 months after the date of the enactment of this Act, the Comptroller General shall submit to Congress a report on the Department of Energy's progress in complying with section 3021(b) of the Solid Waste Disposal Act.

(2) MATTERS TO BE INCLUDED.—The report required under paragraph (1) shall contain, at a minimum, the following:

(A) The Department of Energy's progress in submitting to the States or the Administrator of the Environmental Protection Agency a plan for each facility for which a plan is required under section 3021(b) of the Solid Waste Disposal Act and the status of State or Environmental Protection Agency review and approval of each such plan.

(B) The Department of Energy's progress in entering into orders requiring compliance with any such plans that have been approved.

(C) An evaluation of the completeness and adequacy of each such plan as of the date of submission of the report required under paragraph (1).

(D) An identification of any recurring problems among the Department of Energy's submitted plans.

(E) A description of treatment technologies and capacity that have been developed by the Department of Energy since the date of the enactment of this Act and a list of the wastes that are expected to be treated by such technologies and the facilities at which the wastes are generated or stored.

(F) The progress made by the Department of Energy in characterizing its mixed waste streams at each such facility by sampling and analysis.

(G) An identification and analysis of additional actions that the Department of Energy must take to—

(i) complete submission of all plans required under such section 3021(b) for all such facilities;

(ii) obtain the adoption of orders requiring compliance with all such plans; and

(iii) develop mixed waste treatment capacity and technologies.

SEC. 106. PUBLIC VESSELS.

(a) AMENDMENT.—Subtitle C of the Solid Waste Disposal Act (42 U.S.C. 6921 et seq.) is further amended by adding at the end the following new section:

"SEC. 3022. PUBLIC VESSELS.

"(a) WASTE GENERATED ON PUBLIC VESSELS.—Any hazardous waste generated on a public vessel shall not be subject to the storage, manifest, inspection, or recordkeeping requirements of this Act until such waste is transferred to a shore facility, unless—

"(1) the waste is stored on the public vessel for more than 90 days after the public vessel is placed in reserve or is otherwise no longer in service; or

"(2) the waste is transferred to another public vessel within the territorial waters of the United States and is stored on such vessel or another public vessel for more than 90 days after the date of transfer.

"(b) COMPUTATION OF STORAGE PERIOD.—For purposes of subsection (a), the 90-day period begins on the earlier of—

"(1) the date on which the public vessel on which the waste was generated is placed in reserve or is otherwise no longer in service; or

"(2) the date on which the waste is transferred from the public vessel on which the waste was generated to another public vessel within the territorial waters of the United States;

and continues, without interruption, as long as the waste is stored on the original public vessel (if in reserve or not in service) or another public vessel.

"(c) DEFINITIONS.—For purposes of this section:

"(1) The term 'public vessel' means a vessel owned or bareboat chartered and operated by the United States, or by a foreign nation, except when the vessel is engaged in commerce.

"(2) The terms 'in reserve' and 'in service' have the meanings applicable to those terms under section 7293 and sections 7304 through 7308 of title 10, United States Code, and regulations prescribed under those sections.

"(d) RELATIONSHIP TO OTHER LAW.—Nothing in this section shall be construed as altering or otherwise affecting the provisions of section 7311 of title 10, United States Code.".

(b) TECHNICAL AMENDMENT.—The table of contents for subtitle C of such Act (contained in section 1001) is further amended by adding at the end the following new item:

"Sec. 3022. Public vessels.".

SEC. 107. MUNITIONS.

Section 3004 of the Solid Waste Disposal Act (42 U.S.C. 6924) is amended by adding at the end the following new subsection:

"(y) MUNITIONS.—(1) Not later than 6 months after the date of the enactment of the Federal Facility Compliance Act of 1992, the Administrator shall propose, after consulting with the Secretary of Defense and appropriate State officials, regulations identifying

when military munitions become hazardous waste for purposes of this subtitle and providing for the safe transportation and storage of such waste. Not later than 24 months after such date, and after notice and opportunity for comment, the Administrator shall promulgate such regulations. Any such regulations shall assure protection of human health and the environment.

"(2) For purposes of this subsection, the term 'military munitions' includes chemical and conventional munitions.".

SEC. 108. FEDERALLY OWNED TREATMENT WORKS.

(a) AMENDMENT.—Subtitle C of the Solid Waste Disposal Act (42 U.S.C. 6921 et seq.) is further amended by adding at the end the following new section:

"SEC. 3023. FEDERALLY OWNED TREATMENT WORKS.

"(a) IN GENERAL.—For purposes of section 1004(27), the phrase 'but does not include solid or dissolved material in domestic sewage' shall apply to any solid or dissolved material introduced by a source into a federally owned treatment works if—

"(1) such solid or dissolved material is subject to a pretreatment standard under section 307 of the Federal Water Pollution Control Act (33 U.S.C. 1317), and the source is in compliance with such standard;

"(2) for a solid or dissolved material for which a pretreatment standard has not been promulgated pursuant to section 307 of the Federal Water Pollution Control Act (33 U.S.C. 1317), the Administrator has promulgated a schedule for establishing such a pretreatment standard which would be applicable to such solid or dissolved material not later than 7 years after the date of enactment of this section, such standard is promulgated on or before the date established in the schedule, and after the effective date of such standard the source is in compliance with such standard;

"(3) such solid or dissolved material is not covered by paragraph (1) or (2) and is not prohibited from land disposal under subsections (d), (e), (f), or (g) of section 3004 because such material has been treated in accordance with section 3004(m); or

"(4) notwithstanding paragraphs (1), (2), or (3), such solid or dissolved material is generated by a household or person which generates less than 100 kilograms of hazardous waste per month unless such solid or dissolved material would otherwise be an acutely hazardous waste and subject to standards, regulations, or other requirements under this Act notwithstanding the quantity generated.

"(b) PROHIBITION.—It is unlawful to introduce into a federally owned treatment works any pollutant that is a hazardous waste.

"(c) ENFORCEMENT.—(1) Actions taken to enforce this section shall not require closure of a treatment works if the hazardous waste is removed or decontaminated and such removal or decontamination is adequate, in the discretion of the Administrator or, in the case of an authorized State, of the State, to protect human health and the environment.

"(2) Nothing in this subsection shall be construed to prevent the Administrator or an authorized State from ordering the closure of a treatment works if the Administrator or State determines such closure is necessary for protection of human health and the environment.

"(3) Nothing in this subsection shall be construed to affect any other enforcement authorities available to the Administrator or a State under this subtitle.

"(d) DEFINITION.—For purposes of this section, the term 'federally owned treatment works' means a facility that is owned and operated by a department, agency, or instrumentality of the Federal Government treating wastewater, a majority of which is domestic sewage, prior to discharge in accordance with a permit issued under section 402 of the Federal Water Pollution Control Act.

"(e) SAVINGS CLAUSE.—Nothing in this section shall be construed as affecting any agreement, permit, or administrative or judicial order, or any condition or requirement contained in such an agreement, permit, or order, that is in existence on the date of the enactment of this section and that requires corrective action or closure at a federally owned treatment works or solid waste management unit or facility related to such a treatment works.".

(b) TECHNICAL AMENDMENT.—The table of contents for subtitle C of such Act (contained in section 1001) is further amended by adding at the end the following new item:

"Sec. 3023. Federally owned treatment works.".

SEC. 109. SMALL TOWN ENVIRONMENTAL PLANNING.

(a) ESTABLISHMENT.—The Administrator of the Environmental Protection Agency (hereafter referred to as the "Administrator") shall establish a program to assist small communities in planning and financing environmental facilities. The program shall be known as the "Small Town Environmental Planning Program".

(b) SMALL TOWN ENVIRONMENTAL PLANNING TASK FORCE.—(1) The Administrator shall establish a Small Town Environmental Planning Task Force which shall be composed of representatives of small towns from different areas of the United States, Federal and State governmental agencies, and public interest groups. The Administrator shall terminate the Task Force not later than 2 years after the establishment of the Task Force.

(2) The Task Force shall—

(A) identify regulations developed pursuant to Federal environmental laws which pose significant compliance problems for small towns;

(B) identify means to improve the working relationship between the Environmental Protection Agency (hereafter referred to as the Agency) and small towns;

(C) review proposed regulations for the protection of the environmental and public health and suggest revisions that could improve the ability of small towns to comply with such regulations;

(D) identify means to promote regionalization of environmental treatment systems and infrastructure serving small towns to improve the economic condition of such systems and infrastructure; and

(E) provide such other assistance to the Administrator as the Administrator deems appropriate.

(c) IDENTIFICATION OF ENVIRONMENTAL REQUIREMENTS.—(1) Not later than 6 months after the date of the enactment of this Act, the Administrator shall publish a list of requirements under Federal environmental and public health statutes (and the regulations developed pursuant to such statutes) applicable to small

towns. Not less than annually, the Administrator shall make such additions and deletions to and from the list as the Administrator deems appropriate.

(2) The Administrator shall, as part of the Small Town Environmental Planning Program under this section, implement a program to notify small communities of the regulations identified under paragraph (1) and of future regulations and requirements through methods that the Administrator determines to be effective to provide information to the greatest number of small communities, including any of the following:

(A) Newspapers and other periodicals.

(B) Other news media.

(C) Trade, municipal, and other associations that the Administrator determines to be appropriate.

(D) Direct mail.

(d) SMALL TOWN OMBUDSMAN.—The Administrator shall establish and staff an Office of the Small Town Ombudsman. The Office shall provide assistance to small towns in connection with the Small Town Environmental Planning Program and other business with the Agency. Each regional office shall identify a small town contact. The Small Town Ombudsman and the regional contacts also may assist larger communities, but only if first priority is given to providing assistance to small towns.

(e) MULTI-MEDIA PERMITS.—(1) The Administrator shall conduct a study of establishing a multi-media permitting program for small towns. Such evaluation shall include an analysis of—

(A) environmental benefits and liabilities of a multi-media permitting program;

(B) the potential of using such a program to coordinate a small town's environmental and public health activities; and

(C) the legal barriers, if any, to the establishment of such a program.

(2) Within 3 years after the date of enactment of this Act, the Administrator shall report to Congress on the results of the evaluation performed in accordance with paragraph (1). Included in this report shall be a description of the activities conducted pursuant to subsections (a) through (d).

(f) DEFINITION.—For purposes of this section, the term "small town" means an incorporated or unincorporated community (as defined by the Administrator) with a population of less than 2,500 individuals.

(g) AUTHORIZATION.—There is authorized to be appropriated the sum of $500,000 to implement this section.

SEC. 110. CHIEF FINANCIAL OFFICER REPORT.

The Chief Financial Officer of each affected agency shall submit to Congress an annual report containing, to the extent practicable, a detailed description of the compliance activities undertaken by the agency for mixed waste streams, and an accounting of the fines and penalties imposed on the agency for violations involving mixed waste.

Public Law 102-386
102d Congress

TITLE II—METROPOLITAN WASHINGTON WASTE MANAGEMENT STUDY ACT

SEC. 201. SHORT TITLE.

This title may be cited as the "Metropolitan Washington Waste Management Study Act".

SEC. 202. FINDINGS.

The Congress finds that the I-95 Sanitary Landfill, in Lorton, Virginia, is located on Federal land, and the ultimate responsibility for maintaining environmental integrity at such landfill is on the Federal Government, as well as the signatories to the July 1981 I-95 Sanitary Landfill Memorandum of Understanding.

SEC. 203. ENVIRONMENTAL IMPACT STATEMENT

(a) ENVIRONMENTAL IMPACT STATEMENT.—Except as provided in subsection (b), in order to assure environmental integrity in and around properties owned by the Government of the United States, no expansion of the I-95 Sanitary Landfill shall be permitted or otherwise authorized unless—

(1) an environmental impact statement, pursuant to the National Environmental Policy Act, regarding any such proposed expansion has been completed and approved by the Administrator; and

(2) the costs incurred in conducting and completing such environmental impact statement are paid (A) from the landfill's so-called enterprise fund established pursuant to the July 1981 I-95 Sanitary Landfill Memorandum of Understanding, or (B) in accordance with some other payment formula based on past and projected percentage of the jurisdictional usage of the landfill.

(b) EXCEPTION.—(1) Notwithstanding subsection (a), the I-95 Sanitary Landfill may be expanded for the purpose of the ash monofill planned by the parties to the July 1981 I-95 Sanitary Landfill Memorandum of Understanding if such monofill, subject to paragraph (2), is used solely for the disposal of incinerator ash from such parties.

(2) The ash monofill referred to in paragraph (1) may be used for the disposal of solid waste for a maximum of 30 days whenever a resource recovery facility, or an incinerator and a resource recovery facility, operated for or by the parties to the July 1981 I-95 Sanitary Landfill Memorandum of Understanding is completely unavailable because of an emergency shutdown.

(c) LIMITATION.—After December 31, 1995, the I-95 Sanitary Landfill, including any expansions thereof, shall not be available to receive or dispose of municipal or industrial waste of any kind other than incinerator ash unless the conditions enumerated in subsection (a) are met.

(d) GENERAL.—Notwithstanding any other provision of this title, the parties of the July 1981 I-95 Sanitary Landfill Memorandum of Understanding, together with the Federal Government, shall continue to be responsible for maintaining environmental stability at the I-95 Sanitary Landfill, including any expansion, in accordance with applicable laws of the United States, the Commonwealth

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of Virginia, and the local jurisdictions in which the I-95 Sanitary Landfill is located.

SEC. 204. DEFINITIONS.

For purposes of this title:

(1) The term "expansion" includes any development or use, after May 31, 1991, of any lands (other than those lands which were used as a landfill on or before May 31, 1991) owned by the Government of the United States in and around Lorton, Virginia, for the purpose of, or use as, a sanitary landfill in accordance with the July 1981 I-95 Sanitary Landfill Memorandum of Understanding. The term also includes variances or exemptions from any elevation requirements relating to landfill operations established by the laws of the Commonwealth of Virginia, or any subdivision thereof, in connection with any such lands used on or before May 31, 1991.

(2) The term "lands owned by the Government of the United States" includes any lands owned by the United States, and any such lands with respect to which the Government of the District of Columbia has beneficial ownership.

(3) The term "July 1981 I-95 Sanitary Landfill Memorandum of Understanding" means the document titled "Memorandum of Understanding I-95 Resource Recovery, Land Reclamation, and Recreation Complex" that was executed July 22, 1981, and subsequently amended by supplemental agreements executed before May 31, 1991.

Approved October 6, 1992

APPENDIX B

Technology Development

B. APPENDIX - TECHNOLOGY DEVELOPMENT

B.1 Introduction

This appendix supplies details concerning the technology development activities supported by DOE in the area of mixed waste management. The information gathering activity which supported the production of this part of the Mixed Waste Inventory Report began with a different purpose. A mixed waste technology development inventory was proposed to provide a baseline from which further development activity needs could be assessed. In addition to supplying information for this report these data will be used, as originally intended, in future planning.

Two parts of this appendix are important. The more important of the two is the collection of technology development summaries. There are 267 summaries collected from several sources, which will be described later. The second important part consists of tables which group technologies by one several attributes such as target site and cross-complex applicability as well as relationship to RCRA BDATs. Shorter tables based on site-specific and BDAT relationships have been presented individually in the site chapters encountered earlier in this report. The following narrative describes how the technology development data were gathered, the attributes which were used to define the technology development activity, and the data base in which this information was stored. In addition, the structure and content of the technology development tables will be explained.

B.2 Sources of the Mixed Waste Technology Development Data

The majority of the data collected concerning mixed waste technology development activities supported by DOE were found in the Technology Task Plans (TTPs) which the OTD uses to describe its supported development activities. Of the 267 programs about which information was gathered approximately 210 of these were funded by OTD. The rest were supported by a mixture of EM-30, EM-40, and DP. The majority of these were EM-30 activities.

At the beginning of the technology information gathering process a series of questions were formulated. The answers to these questions describe important attributes of a technology development activity. Information was collected which described:

1. A description of the technology development activity.
2. A description of the purpose or need for the activity.
3. Details about the type of waste to which the technology is applicable.
4. The deliverable product, process, data, etc. at the end of the project.
5. Milestones and project schedule.

This information was the core about which other questions which provided more detail about the programs and their goals were structured. A questionnaire which included all of these queries was designed.

Seven field offices were visited by teams with the purpose of gathering information concerning site-specific technology development activities. The information gathered during these trips concerned, mainly, programs being supported by EM-30, EM40, and DP. During interviews with waste management and technology development personnel questionnaires were filled out for each

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identified technology development activity related to mixed waste. Approximately seventy programs were identified. The information contained in the query fields of the questionnaire were used to fill corresponding data fields in a computer database. The database management software is FileMaker Pro (Claris Corp.). The information in this database will be upgraded with more detail for each of the development activities as the information becomes available.

B.3 Technology Development Summaries and Tables

A second data base containing summary information was prepared from selected fields of the questionnaires as well as from information contained in the OTD TTPs. The important information contained in these summaries is a description of the activity, a description of the need, and the expected results. Additional information concerning the location of the activity, the site for which the development is targeted (if it is site-specific) and its relation to RCRA BDATs is also included. An index number (ID: xxx) is also supplied for convenience in referencing individual summaries in the database. The collection of these summaries which is found in Section BB provides the best overall description of DOE's current mixed waste technology development activities.

An attempt has been made to provide useful ways of examining related groups of development activities. As has been seen in some of the site chapters, site-specific technology development activities were presented which targeted site-specific issues. This is one useful grouping. In an overall view of Complex-wide waste management issues a grouping of development activities by the BDAT to which they are related can be useful. Since the BDATs are specified for treatment of specific wastes, technology developments which relate to a particular BDAT will be useful to consider when faced with managing wastes for which that BDAT is specified. Table B-1 is a duplication of Table 6.5-1 in the body of the report. It is included here as a convenience for the reader. The Tables B-2 and B-3 utilize the BDAT acronyms found in Table B-1.

Tables B-2 and B-3 are further grouped according to the waste matrix addressed by the technology under development. Each of these sections is headed by a the relevant portion of Table 6.5-3 concerned with a specific waste matrix. As an example, the following appears at the beginning of Table B-2:

General Waste Matrix Category	Waste stream sets/with numbered subcategories (from SNL data call)	Matrix disposition	RCRA organic treatment	RCRA inorganic treatment
Organic liquids	1 Organic liquids	Organic destruction	INCIN, LLEXT	STABL,IMERC (inorg. residue)

Target Site: Argonne National Laboratory East

BDAT: INCIN

Summary Tech Area ID: waste destruction and stabilization

88 Unvented Thermal Process for Treatment of ANL Mixed Waste

BDAT: PRECP

Summary Tech Area ID: chemical physical treatment

337 Preparation of a Preliminary Waste Treatment Plan and Installation of a Filtration System for nonTRU Mixed Waste

TABLE B-1

TECHNOLOGY BASED TREATMENT STANDARDS

ADGAS	Venting of a compressed gas onto an absorbing or reacting medium
AMGLM	Amalgamation of elemental Hg contaminated with radionuclides using Cu, Zn, Ni, Au, or S
BIODG	Biodegradation of organic or nonmetallic inorganics
CARBN	Carbon adsorption of nonmetallic inorganics, organometallics, and/or organics
CHOXD	Chemical oxidation or electrolytic oxidation using one of a list of specified oxidizers
CHRED	Chemical reduction using one of a list of specified reducing agents
DEACT	Deactivation to remove hazardous characteristics, e.g. corrosivity, ignitability, reactivity
FSUBS	Fuel substitution in units operated in accordance with applicable technical standards
HLVIT	Vitrification of high-level mixed radioactive wastes
IMERC	Incineration of wastes containing organics and mercury
INCIN	Incineration in units operated in accordance with 40 CFR 254 and 40 CFR 265
LLEXT	Liquid- extraction of organics
MACRO	Macroencapsulation with surface coating and contacting materials
NEUTR	Neutralization with acids, bases or water
NLDBR	No land disposal based on recycling
PRECP	Chemical precipitation of metals or other inorganics with a selection of anions, etc.
RBERY	Thermal recovery of beryllium
RCGAS	Recovery/reuse of compressed gas
RCORR	Recovery of acids or bases with one of a list of specified technologies
RLEAD	Thermal recovery of lead in secondary smelters
RMERC	Roasting or retorting for the volatilization, capture and recovery of Hg
RMETL	Recovery of metals using one of a list of specified technologies
RORGS	Recovery of organics using one of a list of specified technologies
RTHRM	Thermal recovery of metals or inorganics as described in 40 CFR 260.10
RZINC	Resmelting for the recovery of zinc
STABL	Stabilization with Portland cement, lime/pozzolans with possible additives
SSTRP	Steam stripping of organics from liquid wastes
WETOX	Wet air oxidation
WTRRX	Controlled reaction with water for highly reactive organics and inorganics

This example shows that the matrix being considered is **organic liquids**. Within this matrix category Argonne National Laboratory-East is the target of two site-specific technology development activities. Titles for these activities are included as well as an indication of the BDAT to which they relate. The numbers 88 and 337 are the index number used for referencing these individual summaries in the database.

A number of people were involved in scanning the original database in order to relate BDATs to technologies. As a result there are some places in these tables where the reader may not agree that a particular development activity ought to be associated with the BDAT represented in these tables. In following versions of these tables these points will be resolved in the database. In the case of supporting technologies such as those concerned with characterization or retrieval there were a number of BDATs that these technologies could support. As a result there numerous instances throughout these tables in which a technology development appears several times, associated with different BDATs.

Table B-3 is structured in much the same way as Table B-2. However, the intent of Table B-3 is to present those technologies with probable cross-complex applications. The listed target in this instance is listed as "cross-complex". As in Table B-2 the lists are divided by waste matrix. Each section once again starts with matrix description of Table 6.5-3. At the end of each cross complex section, is a subsection which presents the site-specific activities which are deemed to have cross-complex implications.

Section BB of this appendix contains the Technology development summaries as well as an index to the summary pages. The index is comprised of four sections. These sections are:

1. Numerical list in ascending order of technology ID number. This list includes the ID number, technology development activity title, and the page number for the narrative description of that technology development activity.

2. A list by target site.

3. A list by alphabetically ordered BDATs

4. A list by summary functional area., e.g. characterization, retrieval, final form, etc.

In all cases the summary ID number appears on the left of the title for the activity.

B.3.1 Site-Specific Technology Development

In the following Site-Specific and Cross-complex Technology Development Treatability Summary Tables, Table B-2 and Table B-3, the general waste matrix categories are presented at a more summary level than in Chapter 6. Organic debris is included in the Organic solids, sludges and debris category. Inorganic debris and soils are included in the Inorganic solids, sludges, soils and debris category. Reactive/dangerous and inherently hazardous are included in the Other category. However, the general waste matrix categories presented here for grouping technology development activities are consistent with those in Chapter 6, and will serve as the basis for more detailed future evaluation.

The following Site-Specific Technology Development Treatability Summary, Table B-2, lists technology development activities which are potentially applicable to the treatment standards and BDATs identified in Chapter 6.0. Additionally, crosscutting technology development activities not assigned to treatability groups or BDATs are listed. The tables also include, and explicitly identify, technology development activities that do not link to specific BDAT RCRA treatment functions, but provide other supporting functions necessary for treatment systems. Where BDAT is indicated as

NA, or is blank, the technology development activity does not link to specific BDAT RCRA treatment functions, but is intended to provide other supporting functions.

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY

General Waste Matrix Category	Waste stream sets/with numbered subcategories (from SNL data call)	Matrix disposition	RCRA organic treatment	RCRA inorganic treatment
Organic liquids	1 Organic liquids	Organic destruction	INCIN, LLEXT,	STABL, IMERC (inorg. residue)

Target Site: Argonne National Laboratory East

BDAT: INCIN

Summary Tech Area ID: waste destruction & stabilization

88 Unvented Thermal Process for Treatment of ANL Mixed Waste

BDAT: PRECP

Summary Tech Area ID: chemical physical treatment

337 Preparation of a Preliminary Waste Treatment Plan and Installation of a Filtration System for nonTRU Mixed Waste

Target Site: Hanford

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

146 UST: Integrated Instrument Platform for In-Situ Characterization of Tank Wastes [new title pending]

Summary Tech Area ID: retrieval

149 UST: Simulants for Retrieval Tasks

Summary Tech Area ID: system analysis

264 UST: Tank Waste Processing Analysis

268 Advanced Chemical Separation: Simulation of Performance of Unit Operations and Systems of Such Operations proposed to effect Advanced Chemical Separation of Hanford Waste Streams

281 Comprehensive Sludge/Supernate DT&E

Target Site: Idaho

BDAT: HLVIT

Summary Tech Area ID: final form

344 Immobilization of calcine HLW

Target Site: K-25/Y-12 Plant (Oak Ridge)

BDAT: HLVIT

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

BDAT: STABL

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
4 Compositional characterization OR LDR FFCA Treatment Development and Implementation, and

Target Site: Lawrence Livermore National Laboratory
BDAT: CHOXD
Summary Tech Area ID: waste destruction & stabilization
39 UV/H2O2 Oxidation of MW
BDAT: INCIN
Summary Tech Area ID: waste destruction & stabilization
3 Molten Salt Destruction of Hazardous and Mixed Wastes
33 Wet Oxidation of Ion Exchange Resins
BDAT: WETOX
Summary Tech Area ID: waste destruction & stabilization
33 Wet Oxidation of Ion Exchange Resins
BDAT: HLVIT
Summary Tech Area ID: final form
40 Ceramic Waste Forms LLNL
69 Immobilization of Wastes in Ceramics
BDAT: STABL
Summary Tech Area ID: final form
40 Ceramic Waste Forms LLNL
69 Immobilization of Wastes in Ceramics

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: front end handling
32 Multiple Sensor Integration for Material Segregation-1

Target Site: Los Alamos National Laboratory
BDAT: CHOXD
Summary Tech Area ID: waste destruction & stabilization
414 Delphi DETOX
BDAT: IMERC
Summary Tech Area ID: waste destruction & stabilization
414 Delphi DETOX
BDAT: INCIN
Summary Tech Area ID: waste destruction & stabilization
87 Two-stage PBR/SDP for LLMW
414 Delphi DETOX
BDAT: WETOX
Summary Tech Area ID: waste destruction & stabilization
414 Delphi DETOX

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
127 Robotic NDA & Analytical Sample Characterization

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Summary Tech Area ID: other
89 1. Replacement of Glovebox Gloves with Non-Hazardous Alternative
2. CLS-1 Waste Minimization/Mitigation Plan
3. Nuclear Reactor Fuel Reprocessing
4. Waste Characterization

Summary Tech Area ID: waste minimization
123 EXCEL
126 Supercritical Fluid Carbon Dioxide to Replace Chlorocarbon Solvents for Cleaning Plutonium

Target Site: Oak Ridge National Laboratory (X-10)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: retrieval
10 Sludge mobilization and transport

Target Site: Rocky Flats
BDAT: CHOXD
Summary Tech Area ID: waste destruction & stabilization
6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)
137 Catalytic Chemical Oxidation

365 Mediated Electrolytic Oxidation (MEO) Alternative (PNL)

BDAT: INCIN
Summary Tech Area ID: offgas technology
202 Real-Time Emission Monitoring
Summary Tech Area ID: waste destruction & stabilization
6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)
134 Thermal Treatment Process Unit/Fluidized Bed
137 Catalytic Chemical Oxidation
201 Packed-Bed Reactor/Silent Discharge Plasma (PBR/SDP)
365 Mediated Electrolytic Oxidation (MEO) Alternative (PNL)

BDAT: HLVIT
Summary Tech Area ID: final form
135 Microwave Solidification

BDAT: STABL
Summary Tech Area ID: final form
135 Microwave Solidification
136 Cement Solidification of Sludge, Salts and Ash (CTMP Compliance)

Target Site: Sandia National Laboratories (Albq)
BDAT: BIODG
Summary Tech Area ID: containment
198 Los Alamos Program for Barriers and Post Closure Monitoring

BDAT: STABL
Summary Tech Area ID: containment
198 Los Alamos Program for Barriers and Post Closure Monitoring

Target Site: Savannah River
BDAT: BIODG
Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites;

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Off Gas Treatment

BDAT: CHOXD

Summary Tech Area ID: offgas technology

328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

Summary Tech Area ID: waste destruction & stabilization

360 Destruction of HAZ/MIXED/TRU waste - organic material oxidation process

BDAT: INCIN

Summary Tech Area ID: offgas technology

328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

352 Off-gas treatment studies

353 Hazardous metals transport in incinerators

Summary Tech Area ID: waste destruction & stabilization

295 Cold Plasma Destruction of Savannah River Off-Gas VOCs

302 Pulsed Ultraviolet Irradiation Gas-Treatment Technology

313 High Energy Corona for Destruction of VOCs in Process Off-Gases

354 Rotary kiln seal tests

360 Destruction of HAZ/MIXED/TRU waste - organic material oxidation process

BDAT: WTRRX

Summary Tech Area ID: waste destruction & stabilization

350 Electron beam treatment of MLLW

BDAT: RMETL

Summary Tech Area ID: offgas technology

353 Hazardous metals transport in incinerators

BDAT: HLVIT

Summary Tech Area ID: final form

349 Immobilization studies

BDAT: STABL

Summary Tech Area ID: final form

349 Immobilization studies

BDAT: CARBN

Summary Tech Area ID: offgas technology

328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: waste minimization

355 CIF related waste minimization activities

026

TABLE B-2

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SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY
(Continued)

General Waste Matrix Category	Waste stream sets/with numbered subcategories (from SNL data call)	Matrix disposition	RCRA organic treatment	RCRA inorganic treatment
Aqueous liquids	2 Aqueous liquids	Evaporation, ion-exchange	WETOX, CHOXD, CARBN	PRECP, CHRED, RMERC, STABL

Target Site: Argonne National Laboratory East

BDAT: RCORR

Summary Tech Area ID: chemical physical treatment

58 Technology Development for Concentrating Process Streams.

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

58 Technology Development for Concentrating Process Streams.

257 Resin Exchange

336 Processing of New Brunswick Laboratory Plutonium Wastes

BDAT: LLEXT

Summary Tech Area ID: chemical physical treatment

336 Processing of New Brunswick Laboratory Plutonium Wastes

BDAT: PRECP

Summary Tech Area ID: chemical physical treatment

337 Preparation of a Preliminary Waste Treatment Plan and Installation of a Filtration System for nonTRU Mixed Waste

Target Site: Hanford

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

146 UST: Integrated Instrument Platform for In-Situ Characterization of Tank Wastes [new title pending]

Summary Tech Area ID: retrieval

149 UST: Simulants for Retrieval Tasks

Summary Tech Area ID: system analysis

264 UST: Tank Waste Processing Analysis

268 Advanced Chemical Separation: Simulation of Performance of Unit Operations and Systems of Such Operations proposed to effect Advanced Chemical Separation of Hanford Waste Streams

281 Comprehensive Sludge/Supernate DT&E

Target Site: Idaho

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

340 Treatment of mixed heavy metal waste

Summary Tech Area ID: final form

345 Treatment of sodium-bearing HLLW

BDAT: HLVIT

Summary Tech Area ID: final form

345 Treatment of sodium-bearing HLLW

BDAT: STABL

Summary Tech Area ID: final form

345 Treatment of sodium-bearing HLLW

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Target Site: K-25/Y-12 Plant (Oak Ridge)

BDAT: HLVIT

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

BDAT: STABL

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

4 Compositional characterization OR LDR FFCA Treatment Development and Implementation, and

Target Site: Lawrence Livermore National Laboratory

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

39 UV/H2O2 Oxidation of MW

BDAT: HLVIT

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

BDAT: STABL

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

Target Site: Los Alamos National Laboratory

BDAT: CHOXD

Summary Tech Area ID: chemical physical treatment

23 Treatment of Electroplating Wastes.

BDAT: INCIN

Summary Tech Area ID: waste destruction & stabilization

87 Two-stage PBR/SDP for LLMW

414 Delphi DETOX

BDAT: RCORR

Summary Tech Area ID: chemical physical treatment

86 Nitric Acid Recycle

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

23 Treatment of Electroplating Wastes.

111 Extraction System for Removal of Radioactive and Hazardous Metal Ions From Aqueous Waste Streams.

113 Advanced Testing Line for Actinide Separations (ATLAS)

116 Water-soluble, Chelating Polymers for Toxic Metal-Ion Separation

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

127 Robotic NDA & Analytical Sample Characterization

Summary Tech Area ID: other

89
1. Replacement of Glovebox Gloves with Non-Hazardous Alternative
2. CLS-1 Waste Minimization/Mitigation Plan
3. Nuclear Reactor Fuel Reprocessing
4. Waste Characterization

Summary Tech Area ID: waste minimization

123 EXCEL

BDAT: NLDBR

Summary Tech Area ID: waste minimization

124 Hydrochloric Acid Recycle

Target Site: Rocky Flats

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)

BDAT: INCIN

Summary Tech Area ID: waste destruction & stabilization

6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)

BDAT: STABL

Summary Tech Area ID: final form

132 Cement Solidification (Solar Pond Cleanout)

136 Cement Solidification of Sludge, Salts and Ash (CTMP Compliance)

277 Polymer Solidification

Target Site: Sandia National Laboratories (Albq)

BDAT: BIODG

Summary Tech Area ID: containment

198 Los Alamos Program for Barriers and Post Closure Monitoring

BDAT: STABL

Summary Tech Area ID: containment

198 Los Alamos Program for Barriers and Post Closure Monitoring

Target Site: Savannah River

BDAT: BIODG

Summary Tech Area ID: offgas technology

328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

Summary Tech Area ID: waste destruction & stabilization

305 Soil Bioreactor Studies

BDAT: CHOXD

Summary Tech Area ID: offgas technology

328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

BDAT: INCIN

Summary Tech Area ID: offgas technology

328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

BDAT: HLVIT

Summary Tech Area ID: final form

349 Immobilization studies

BDAT: STABL

Summary Tech Area ID: final form

349 Immobilization studies

BDAT: CARBN

Summary Tech Area ID: offgas technology

328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

General Waste Matrix Category	Waste stream sets/with numbered subcategories (from SNL data call)	Matrix disposition	RCRA organic treatment	RCRA inorganic treatment
Organic solids, sludges and debris	**Homogeneous organic solids** 3 Organic sludges/ Particulates	Organic destruction, wash leach and recycle	INCIN, CHOXD, (applied to extract, wash or leachate)	STABL, RMERC (inorg. residue) CHRED, CARBN (aqueous washes, etc.)
	Organic Debris 6 Organic Debris	Extract, wash, leach, or immobilize and direct dispose as appropriate under debris rule	same - applied to extract, wash or leachate	

Target Site: Fernald

BDAT: HLVIT

Summary Tech Area ID: waste destruction & stabilization

56 Minimum Additive Waste Stabilization (MAWS)

Target Site: Hanford

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

146 UST: Integrated Instrument Platform for In-Situ Characterization of Tank Wastes [new title pending]

Summary Tech Area ID: retrieval

149 UST: Simulants for Retrieval Tasks

Summary Tech Area ID: system analysis

264 UST: Tank Waste Processing Analysis

268 Advanced Chemical Separation: Simulation of Performance of Unit Operations and Systems of Such Operations proposed to effect Advanced Chemical Separation of Hanford Waste Streams

281 Comprehensive Sludge/Supernate DT&E

377 Efficient Separations Processes Integrated Program - Comprehensive Sludge/Supernate R&D

Target Site: Idaho

BDAT: HLVIT

Summary Tech Area ID: final form

344 Immobilization of calcine HLW

BDAT: MACRO

Summary Tech Area ID: final form

341 Lead macroencapsulation (Support of the Radioactive Waste Management Complex (RWMC))

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

BDAT: STABL
Summary Tech Area ID: final form
342 Sulfur polymer cement immobilization

Target Site: K-25/Y-12 Plant (Oak Ridge)
BDAT: HLVIT
Summary Tech Area ID: final form
9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation
BDAT: STABL
Summary Tech Area ID: final form
9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
4 Compositional characterization OR LDR FFCA Treatment Development and Implementation, and

Target Site: Lawrence Livermore National Laboratory
BDAT: CHOXD
Summary Tech Area ID: waste destruction & stabilization
39 UV/H2O2 Oxidation of MW
BDAT: INCIN
Summary Tech Area ID: waste destruction & stabilization
3 Molten Salt Destruction of Hazardous and Mixed Wastes
25 Wet Oxidation C-21/Nuc. Ind.
33 Wet Oxidation of Ion Exchange Resins
BDAT: WETOX
Summary Tech Area ID: waste destruction & stabilization
25 Wet Oxidation C-21/Nuc. Ind.
33 Wet Oxidation of Ion Exchange Resins
BDAT: HLVIT
Summary Tech Area ID: final form
40 Ceramic Waste Forms LLNL
69 Immobilization of Wastes in Ceramics
BDAT: STABL
Summary Tech Area ID: final form
40 Ceramic Waste Forms LLNL
69 Immobilization of Wastes in Ceramics

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
65 Whole Barrel Survey and Segregation
Summary Tech Area ID: front end handling
32 Multiple Sensor Integration for Material Segregation-1
Summary Tech Area ID: robotics
64 Automated Glovebox Processing
122 Multiple Sensor Integration for Material Segregation-2

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Target Site: Los Alamos National Laboratory

BDAT: BIODG

Summary Tech Area ID: chemical physical treatment

419 Biodegradation of nitrated rags

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

414 Delphi DETOX

BDAT: IMERC

Summary Tech Area ID: waste destruction & stabilization

414 Delphi DETOX

BDAT: INCIN

Summary Tech Area ID: waste destruction & stabilization

87 Two-stage PBR/SDP for LLMW

204 Electron-Beam Waste Treatment Test Bed

414 Delphi DETOX

BDAT: WETOX

Summary Tech Area ID: waste destruction & stabilization

414 Delphi DETOX

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

116 Water-soluble, Chelating Polymers for Toxic Metal-Ion Separation

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

127 Robotic NDA & Analytical Sample Characterization

Summary Tech Area ID: waste minimization

94 Reuse, Recycling, and Decomposition of Calcium Chloride

123 EXCEL

Target Site: Oak Ridge National Laboratory (X-10)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: retrieval

10 Sludge mobilization and transport

Target Site: Rocky Flats

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)

137 Catalytic Chemical Oxidation

365 Mediated Electrolytic Oxidation (MEO) Alternative (PNL)

BDAT: INCIN

Summary Tech Area ID: offgas technology

202 Real-Time Emission Monitoring

Summary Tech Area ID: waste destruction & stabilization

6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)

134 Thermal Treatment Process Unit/Fluidized Bed

137 Catalytic Chemical Oxidation

365 Mediated Electrolytic Oxidation (MEO) Alternative (PNL)

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

BDAT: HLVIT
Summary Tech Area ID: final form
135 Microwave Solidification
BDAT: STABL
Summary Tech Area ID: final form
132 Cement Solidification (Solar Pond Cleanout)
135 Microwave Solidification
136 Cement Solidification of Sludge, Salts and Ash (CTMP Compliance)
277 Polymer Solidification

Target Site: Savannah River
BDAT: CHOXD
Summary Tech Area ID: waste destruction & stabilization
360 Destruction of HAZ/MIXED/TRU waste - organic material oxidation process
BDAT: INCIN
Summary Tech Area ID: offgas technology
352 Off-gas treatment studies
353 Hazardous metals transport in incinerators
Summary Tech Area ID: waste destruction & stabilization
295 Cold Plasma Destruction of Savannah River Off-Gas VOCs
354 Rotary kiln seal tests
360 Destruction of HAZ/MIXED/TRU waste - organic material oxidation process
BDAT: RMETL
Summary Tech Area ID: chemical physical treatment
359 Destruction of HAZ/MIXED/TRU waste - removing plutonium oxide
Summary Tech Area ID: offgas technology
353 Hazardous metals transport in incinerators
BDAT: HLVIT
Summary Tech Area ID: final form
349 Immobilization studies
BDAT: STABL
Summary Tech Area ID: final form
349 Immobilization studies

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
319 Fiber Optic Sensor and Analysis for the Integrated Demonstration for Cleanup of Soils and Groundwater in Non-Arid Sites

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

General Waste Matrix Category	Waste stream sets/with numbered subcategories (from SNL data call)	Matrix disposition	RCRA organic treatment	RCRA inorganic treatment
Inorganic solids, sludges, soils and debris	**Homogeneous inorganic solids** 4 Inorganic sludges/ Particulates, 5 Cemented Solids	Extract, wash, leach, direct disposal	INCIN, CHOXD (applied to extract, wash or leachate)	STABL, RMERC (inorg. residue) CHRED, CARBN (aqueous washes, etc.)
	Soils 9 Soils with <50% Debris, 10 Soils	same	same	same
	Debris 7 Inorganic Debris, 8 Heterogeneous Debris	Extract, wash, leach, or immobilize and direct dispose as appropriate under debris rule	same	same

Target Site: Fernald

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

410 Soil Washing Treatability Study

BDAT: HLVIT

Summary Tech Area ID: waste destruction & stabilization

56 Minimum Additive Waste Stabilization (MAWS)

BDAT: PRECP

Summary Tech Area ID: chemical physical treatment

410 Soil Washing Treatability Study

BDAT: NEUTR

Summary Tech Area ID: chemical physical treatment

410 Soil Washing Treatability Study

Target Site: Hanford

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

146 UST: Integrated Instrument Platform for In-Situ Characterization of Tank Wastes [new title pending]

Summary Tech Area ID: retrieval

149 UST: Simulants for Retrieval Tasks

Summary Tech Area ID: system analysis

264 UST: Tank Waste Processing Analysis

268 Advanced Chemical Separation: Simulation of Performance of Unit Operations and Systems of Such Operations proposed to effect Advanced Chemical Separation of Hanford Waste Streams

281 Comprehensive Sludge/Supernate DT&E

377 Efficient Separations Processes Integrated Program - Comprehensive

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Sludge/Supernate R&D

Target Site: Idaho
BDAT: HLVIT
Summary Tech Area ID: chemical physical treatment
370 Pyrochemical Process for ICPP HLW Calcine
BDAT: MACRO
Summary Tech Area ID: final form
341 Lead macroencapsulation (Support of the Radioactive Waste Management Complex (RWMC))
BDAT: STABL
Summary Tech Area ID: final form
342 Sulfur polymer cement immobilization

Target Site: K-25/Y-12 Plant (Oak Ridge)
BDAT: DEBRIS
Summary Tech Area ID: chemical physical treatment
11 Thermal Desorption, LDR FFCA Treatment Development and Implementation
BDAT: RMERC
Summary Tech Area ID: chemical physical treatment
11 Thermal Desorption, LDR FFCA Treatment Development and Implementation
BDAT: RORGS
Summary Tech Area ID: chemical physical treatment
11 Thermal Desorption, LDR FFCA Treatment Development and Implementation
BDAT: HLVIT
Summary Tech Area ID: final form
9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation
BDAT: STABL
Summary Tech Area ID: final form
9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
4 Compositional characterization OR LDR FFCA Treatment Development and Implementation, and

Target Site: Lawrence Livermore National Laboratory
BDAT: HLVIT
Summary Tech Area ID: final form
40 Ceramic Waste Forms LLNL
69 Immobilization of Wastes in Ceramics
BDAT: STABL
Summary Tech Area ID: final form
40 Ceramic Waste Forms LLNL
69 Immobilization of Wastes in Ceramics

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY
(Continued)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
65 Whole Barrel Survey and Segregation
Summary Tech Area ID: front end handling
32 Multiple Sensor Integration for Material Segregation-1
Summary Tech Area ID: robotics
64 Automated Glovebox Processing
122 Multiple Sensor Integration for Material Segregation-2

Target Site: Los Alamos National Laboratory
BDAT: RMETL
Summary Tech Area ID: chemical physical treatment
105 Oxygen sparge of spent pyrochemical salts.
116 Water-soluble, Chelating Polymers for Toxic Metal-Ion Separation
BDAT: DEACT
Summary Tech Area ID: chemical physical treatment
105 Oxygen sparge of spent pyrochemical salts.

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: other
89
1. Replacement of Glovebox Gloves with Non-Hazardous Alternative
2. CLS-1 Waste Minimization/Mitigation Plan
3. Nuclear Reactor Fuel Reprocessing
4. Waste Characterization

Target Site: Oak Ridge National Laboratory (X-10)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: chemical physical treatment
12 Process to Salt Cake

Target Site: Rocky Flats
BDAT: INCIN
Summary Tech Area ID: offgas technology
202 Real-Time Emission Monitoring
BDAT: RORGS
Summary Tech Area ID: chemical physical treatment
138 Surface Organic Contaminant Removal
BDAT: LLEXT
Summary Tech Area ID: chemical physical treatment
138 Surface Organic Contaminant Removal
BDAT: HLVIT
Summary Tech Area ID: final form
135 Microwave Solidification
BDAT: STABL
Summary Tech Area ID: final form
132 Cement Solidification (Solar Pond Cleanout)

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

135 Microwave Solidification
277 Polymer Solidification

Target Site: Sandia National Laboratories (Albq)
BDAT: BIODG
Summary Tech Area ID: containment
198 Los Alamos Program for Barriers and Post Closure Monitoring

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
273 On-site Analysis of Metals Using ASV
Summary Tech Area ID: characterization Hg,Pb,Cr,As,Sb,Cd
272 Detection and Quantification of High-Z metals with X-Ray Fluorescence

Target Site: Savannah River
BDAT: BIODG
Summary Tech Area ID: waste destruction & stabilization
305 Soil Bioreactor Studies
321 TCE/PCE VEGETATION DEMONSTRATION
BDAT: INCIN
Summary Tech Area ID: offgas technology
352 Off-gas treatment studies
353 Hazardous metals transport in incinerators
Summary Tech Area ID: waste destruction & stabilization
354 Rotary kiln seal tests
BDAT: RMETL
Summary Tech Area ID: chemical physical treatment
359 Destruction of HAZ/MIXED/TRU waste - removing plutonium oxide
Summary Tech Area ID: offgas technology
353 Hazardous metals transport in incinerators
BDAT: HLVIT
Summary Tech Area ID: final form
167 Waste Form and Vitrification Process Development for Mixed Waste
349 Immobilization studies
BDAT: MACRO
Summary Tech Area ID: final form
358 Lead Macroencapsulation
BDAT: STABL
Summary Tech Area ID: final form
167 Waste Form and Vitrification Process Development for Mixed Waste
349 Immobilization studies
356 Waste form for CIF Ash

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

General Waste Matrix Category	Waste stream sets/with numbered subcategories (from SNL data call)	Matrix disposition	RCRA organic treatment	RCRA inorganic treatment
Other wastes	**Lab Packs** 11 Lab Packs with Metal, 12 Lab Packs without Metal	Extract, wash, leach, or immobilize and direct dispose	INCIN, CHOXD (applied to extract, wash or leachate)	STABL, RMERC, CHRED, RMETL
	Reactive/dangerous 13 Reactive Metals, 14 Explosives, 15 Compressed Gases	same	DEACT, WTRRX, RCGAS, ADGAS	STABL, DEACT
	Inherently hazardous 16 Liquid Mercury, 17 Elemental Lead, 18 Beryllium Dust, 19 Batteries	same		AMLGM, MACRO, HLVIT, RTHRM, Recycle
	Misc. Other 99 Other	(Varies)		

Target Site: Argonne National Laboratory East

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

257 Resin Exchange

Target Site: Idaho

BDAT: AMLGM

Summary Tech Area ID: chemical physical treatment

339 Elemental mercury amalgamation

BDAT: STABL

Summary Tech Area ID: final form

343 Iron enriched basalt (IEB) waste forms and processing

Target Site: K-25/Y-12 Plant (Oak Ridge)

BDAT: HLVIT

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

BDAT: STABL

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

Target Site: Lawrence Livermore National Laboratory

BDAT: HLVIT

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

BDAT: STABL

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
65 Whole Barrel Survey and Segregation
Summary Tech Area ID: robotics
64 Automated Glovebox Processing

Target Site: Los Alamos National Laboratory
BDAT: CHOXD
Summary Tech Area ID: chemical physical treatment
22 Oxidation process for depleted uranium
23 Treatment of Electroplating Wastes.
BDAT: RMETL
Summary Tech Area ID: chemical physical treatment
23 Treatment of Electroplating Wastes.
BDAT: HLVIT
Summary Tech Area ID: final form
416 CAI Vitrification
BDAT: STABL
Summary Tech Area ID: chemical physical treatment
22 Oxidation process for depleted uranium
Summary Tech Area ID: final form
416 CAI Vitrification

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: other
89
1. Replacement of Glovebox Gloves with Non-Hazardous Alternative
2. CLS-1 Waste Minimization/Mitigation Plan
3. Nuclear Reactor Fuel Reprocessing
4. Waste Characterization
BDAT: NLDBR
Summary Tech Area ID: waste minimization
108 Automated Retirement and Integrated Extraction System (ARIES)

Target Site: Rocky Flats
BDAT: INCIN
Summary Tech Area ID: offgas technology
202 Real-Time Emission Monitoring
BDAT: STABL
Summary Tech Area ID: final form
277 Polymer Solidification

Target Site: Sandia National Laboratories (Albq)
BDAT: STABL
Summary Tech Area ID: containment
207 Geochemical Controls on Chromium Mobility

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
218 Neutron Activation Logging System for the MWLID
273 On-site Analysis of Metals Using ASV
Summary Tech Area ID: characterization Hg,Pb,Cr,As,Sb,Cd
272 Detection and Quantification of High-Z metals with X-Ray Fluorescence

Target Site: Savannah River

BDAT: BIODG
Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

BDAT: CHOXD
Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

BDAT: INCIN
Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment
352 Off-gas treatment studies
353 Hazardous metals transport in incinerators

BDAT: RMETL
Summary Tech Area ID: chemical physical treatment
359 Destruction of HAZ/MIXED/TRU waste - removing plutonium oxide
Summary Tech Area ID: offgas technology
353 Hazardous metals transport in incinerators

BDAT: HLVIT
Summary Tech Area ID: final form
349 Immobilization studies
351 Waste form evaluation

BDAT: MACRO
Summary Tech Area ID: final form
351 Waste form evaluation
358 Lead Macroencapsulation

BDAT: STABL
Summary Tech Area ID: chemical physical treatment
357 Silver saddle treatment
Summary Tech Area ID: final form
349 Immobilization studies
351 Waste form evaluation
356 Waste form for CIF Ash

BDAT: CARBN
Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Crosscutting Technology Development Activities (not assigned to treatability groups)

Target Site: K-25/Y-12 Plant (Oak Ridge)

BDAT: INCIN

Summary Tech Area ID: offgas technology

14 Cleanable steel HEPA filter

Target Site: Los Alamos National Laboratory

BDAT: RLEAD

Summary Tech Area ID: chemical physical treatment

85 Decontamination and Recycling of Lead Bricks

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

105 Oxygen sparge of spent pyrochemical salts.

BDAT: STABL

Summary Tech Area ID: chemical physical treatment

24 Controlled reaction of water-reactive wastes

85 Decontamination and Recycling of Lead Bricks

BDAT: DEACT

Summary Tech Area ID: chemical physical treatment

105 Oxygen sparge of spent pyrochemical salts.

BDAT: NEUTR

Summary Tech Area ID: chemical physical treatment

24 Controlled reaction of water-reactive wastes

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: system analysis

415 Process Modeling-Mixed Waste Treatment

BDAT: NA

Summary Tech Area ID: analytical laboratories

181 EPA Validation of prototype individual SLMs
219 Analytical Service Program
385 National Sample Management and Tracking System
386 National Sample Management and Tracking System - RL
387 National Sample Management and Tracking System - AL
388 National Sample Management and Tracking System - RL
389 National Sample Management and Tracking System - SR
390 Methods Modification--Adapting SW-846 Methods for Mixed Waste Analysis
391 Methods Modification--Adapting SW-846 Methods to Mixed Waste Analysis
392 Methods Modification
393 Field Analyses Methods
394 Field Analyses
395 Quality Assurance Requirements Document
396 Performance Evaluation
397 Quality Assessment (Performance Evaluation Program)
398 Performance Evaluation Program
399 Audit Program
400 Audit Program
401 Analytical Cost Reduction (Blind Compliance)
402 Richland Operations Office Program Support Division

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY
(Continued)

403 DQO Guidance Development
404 Interagency Agreement with the EPA Quality Assurance Management Staff
405 Interagency Agreement with the EPA Office of Radiation Programs
406 Interagency Agreement with the EPA Environmental Monitoring Systems Laboratory
407 Interagency Agreement with the EPA Environmental Monitoring Systems Laboratory
408 Interagency Agreement with the Analytical Operations Branch
409 MACTEC

Summary Tech Area ID: characterization
179 Testing and Modification of Standard Laboratory Modules (SLMs)/Standard Support Modules (SSMs)
180 Demonstration of remaining SLMs/SSMs for EPA 3540 & 3550
183 SLM Design for EPA Method Series 3000 SPM
220 BWID Non-Intrusive Sensing
230 BWID Remote Characterization System (RCS)
234 Improvements in Inductively Coupled Plasma Mass Spectrometry
236 Integrated Program - Characterization, Monitoring, and Sensor Technologies
237 Expedited Site Characterization: Application and Continued Development of Rapid, Focused Site Characterization Methodology for Federal Facilities
238 Optimization of Sampling Strategies
283 Problem-Directed Chemical Characterization - Rapid Response (Laser Rangefinder Add-On)
285 Associated Particle Imaging (API) Development
287 Remote Sensing Systems Development
300 3D, 1C/3C Seismic: Three-Dimensional, One- and Three-Component Reflection Seismic for Non-Intrusive Characterization of Environmental Restoration Sites
330 In Situ Secondary Ion Mass Spectrometry (SIMS) Analysis: Development and Evaluation of a Transportable Ion Trap SIMS Instrument for the Direct Analysis of Low Volatile Organic Compounds

Summary Tech Area ID: front end handling
186 AC Swing-Free Crane Control

Summary Tech Area ID: monitoring
280 Waste Stream Diagnostics and Control for Treatment of Mixed Waste

Summary Tech Area ID: other
271 PNL Technology Specification for MWIP
420 Tritium Gas Recovery/Recycle from Tritium Confinement Systems

Summary Tech Area ID: retrieval
221 BWID Retrieval Demonstration: End Effector Evaluation
222 BWID Contamination Control
223 BWID Dig Face Characterization
231 BWID Multiaxis Crane Control System
232 BWID Remote Excavating System (RES) Demonstration

Summary Tech Area ID: waste minimization
418 Chip Collection System for Precision Machining

Target Site: Sandia National Laboratories (Albq)
BDAT: STABL

Summary Tech Area ID: containment
213 Dry Barriers Applications for Landfills

TABLE B-2

SITE-SPECIFIC TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

215 Magnetometer Towed Array

Summary Tech Area ID: containment

199 Migration Barrier Covers for Mixed Waste

203 A Prototype Decision Support System to Select MWL Barrier Cover Systems

210 Remedial Options Evaluation

Target Site: Savannah River

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: final form

413 Radiological Performance Assessment

B.3.2 Summary - Cross-complex technology development

Cross-complex technology development (TD) activity indexed narrative descriptions are presented later in this appendix. Where they are also site-specific, they are discussed in detail in the individual site chapters as well. Evaluations are ongoing to match cross-complex technology development to site-specific needs.

The following Cross-complex Technology Development Treatability Summary, Table B-3, lists cross-complex technology development activities which are potentially applicable to the treatment standards and BDATs identified in Chapter 6.0. Additionally, crosscutting technology development activities not assigned to treatability groups or BDATs are listed. The tables also include, and explicitly identify, technology development activities that do not link to specific BDAT RCRA treatment functions, but provide other supporting functions necessary for treatment systems. Where BDAT is indicated as NA, or is blank, the technology development activity does not link to specific BDAT RCRA treatment functions, but is intended to provide other supporting functions.

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY

General Waste Matrix Category	Waste stream sets/with numbered subcategories (from SNL data call)	Matrix disposition	RCRA organic treatment	RCRA inorganic treatment
Organic liquids	1 Organic liquids	Organic destruction	INCIN, LLEXT,	STABL, IMERC (inorg. residue)

Target Site: Cross-complex

BDAT: BIODG

Summary Tech Area ID: containment

121 Barriers and Post-Closure Monitoring

Summary Tech Area ID: waste destruction & stabilization

115 Biodegradation of Organics in Mixed Wastes

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

28 Supercritical Water Oxidation-1

44 Bremsstrahlung and Electron Beam Project

77 Electrocatalytic Destruction of Organic Waste and Treatment of Mixed Hazardous Wastes

80 Microwave Fluidized Bed Detoxification of Mixed Waste

102 Chemical Detoxification

369 SUPERCRITICAL WATER OXIDATION (SCWO) DEMONSTRATION PROGRAM

BDAT: CHRED

Summary Tech Area ID: chemical physical treatment

34 LDRD-Nitrate Destruction

BDAT: DEBRIS

Summary Tech Area ID: waste destruction & stabilization

226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR

BDAT: INCIN

Summary Tech Area ID: offgas technology

212 Sandia/Livermore Technology Specification for MWIP/OGT

16 E-Beam Radiolysis of Simulated Hanford Waste

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

28 Supercritical Water Oxidation-1
29 Supercritical Water Oxidation-2
79 Controlled Air Incinerator
80 Microwave Fluidized Bed Detoxification of Mixed Waste
115 Biodegradation of Organics in Mixed Wastes
117 Ultrasonic Detoxification of Groundwater and Soil
128 Hydrothermal processing
200 Waste Destruction and Stabilization Technology Specification
226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR
259 Calcination Process Development to Treat Hanford's Tank Waste
275 Mixed Waste Destruction (Vitrification)
282 ORNL Program Support for MWIP (New Name: Plasma Design & Test)
369 SUPERCRITICAL WATER OXIDATION (SCWO) DEMONSTRATION PROGRAM

BDAT: WETOX

Summary Tech Area ID: waste destruction & stabilization
29 Supercritical Water Oxidation-2
117 Ultrasonic Detoxification of Groundwater and Soil

BDAT: WTRRX

Summary Tech Area ID: waste destruction & stabilization
347 UV photolysis

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment
38 Heavy Metal Removal by Electrodeposition
104 Magnetic separation
Summary Tech Area ID: final form
81 Liquid Metal Recycle and Waste Treatment
Summary Tech Area ID: offgas technology
212 Sandia/Livermore Technology Specification for MWIP/OGT
Summary Tech Area ID: waste destruction & stabilization
200 Waste Destruction and Stabilization Technology Specification

BDAT: HLVIT

Summary Tech Area ID: final form
1 Ceramic Waste forms ANL
98 Chemically Bonded Ceramic Waste Forms
Summary Tech Area ID: offgas technology
212 Sandia/Livermore Technology Specification for MWIP/OGT
Summary Tech Area ID: waste destruction & stabilization
226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR
275 Mixed Waste Destruction (Vitrification)

BDAT: STABL

Summary Tech Area ID: containment
121 Barriers and Post-Closure Monitoring
Summary Tech Area ID: final form
1 Ceramic Waste forms ANL
98 Chemically Bonded Ceramic Waste Forms
240 Polyethylene Encapsulation of Low-Level Single Shell Tank Wastes

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization
75 Radiation-Based Mixed Waste Characterization.

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY
(Continued)

110 Hydrocarbon Sensors
144 UST: Early Deployment System (EDS) - Robotic Characterization of UST
145 UST: Light Duty Utility Arm
148 UST: Light Duty Utility Arm Sampling End-Effector
164 DIAL - The Diagnostic Instrumentation and Analysis Laboratory
172 UST:SF211203 Raman Spectroscopy system
192 Sensing Systems
261 Waste Analysis with Laser Raman Spectroscopy
318 In Situ Detection of Organics, Demo Support

Summary Tech Area ID: characterization, monitoring & assay
20 Laser Induced Breakdown Spectroscopy

Summary Tech Area ID: front end handling
185 Drum Opening, Emptying, and Transportation Systems

Summary Tech Area ID: monitoring
26 Integrated Manufacturing Design Initiative-LIBS

Summary Tech Area ID: other
161 UST: Waste Retrieval Project Coordination
265 Efficient Separations/Processes Integrated Program (ESPIP)--Coordination, Program Development, and Technology Evaluation Tasks.

Summary Tech Area ID: retrieval
142 UST: Excavation and Retrieval UST Wastes By Water Jets (Confined Sluicing)
143 UST: Wastes Dislodging Technology Development
147 UST: Waste Dislodging and Conveyance Technology
150 UST: Multi-Functional Scarifier/Conveyer: Design and Development of a Multifunction Scarifier End Effector with an Integral Conveyance System
151 UST: Hydraulics Technology: Hydraulics Technology in Support of Tank Waste Dislodging and Conveyance Systems Development
153 UST: Long Reach Arm - Control System
154 UST: Baseline Technologies for UST Remediation
155 UST: Long Reach Arm - Systems Coordination and Definition
156 UST: Light Duty Utility Arm - Laser Range Finder
157 UST: Long Reach Arm - Maintenance and Decontamination
158 UST: Light Duty Arm - Technical Interface
159 UST: Light Duty Utility Arm - Computer Interface/End Effector
160 UST: Long Reach Arm - Computer Interface
162 UST: Waste Dislodging
173 Storage Tanks-West: Long Reach Manipulator (LRM) System
174 Storage Tanks - East: Silo Waste Retrieval System (WRS) and Cost/Benefit Analysis

Summary Tech Area ID: system analysis
120 System Analysis

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY
(Continued)

Site-specific technology development activities with potential cross-complex applicability

Target Site: Argonne National Laboratory East

BDAT: INCIN

Summary Tech Area ID: waste destruction & stabilization

88 Unvented Thermal Process for Treatment of ANL Mixed Waste

BDAT: PRECP

Summary Tech Area ID: chemical physical treatment

337 Preparation of a Preliminary Waste Treatment Plan and Installation of a Filtration System for nonTRU Mixed Waste

Target Site: Hanford

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

146 UST: Integrated Instrument Platform for In-Situ Characterization of Tank Wastes [new title pending]

Summary Tech Area ID: retrieval

149 UST: Simulants for Retrieval Tasks

Summary Tech Area ID: system analysis

264 UST: Tank Waste Processing Analysis

268 Advanced Chemical Separation: Simulation of Performance of Unit Operations and Systems of Such Operations proposed to effect Advanced Chemical Separation of Hanford Waste Streams

281 Comprehensive Sludge/Supernate DT&E

Target Site: Idaho

BDAT: HLVIT

Summary Tech Area ID: final form

344 Immobilization of calcine HLW

Target Site: K-25/Y-12 Plant (Oak Ridge)

BDAT: HLVIT

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

BDAT: STABL

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

4 Compositional characterization OR LDR FFCA Treatment Development and Implementation, and

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Target Site: Lawrence Livermore National Laboratory

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

39 UV/H2O2 Oxidation of MW

BDAT: INCIN

Summary Tech Area ID: waste destruction & stabilization

3 Molten Salt Destruction of Hazardous and Mixed Wastes

33 Wet Oxidation of Ion Exchange Resins

BDAT: WETOX

Summary Tech Area ID: waste destruction & stabilization

33 Wet Oxidation of Ion Exchange Resins

BDAT: HLVIT

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

BDAT: STABL

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: front end handling

32 Multiple Sensor Integration for Material Segregation-1

Target Site: Los Alamos National Laboratory

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

414 Delphi DETOX

BDAT: IMERC

Summary Tech Area ID: waste destruction & stabilization

414 Delphi DETOX

BDAT: INCIN

Summary Tech Area ID: waste destruction & stabilization

87 Two-stage PBR/SDP for LLMW

414 Delphi DETOX

BDAT: WETOX

Summary Tech Area ID: waste destruction & stabilization

414 Delphi DETOX

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

127 Robotic NDA & Analytical Sample Characterization

Summary Tech Area ID: other

89
1. Replacement of Glovebox Gloves with Non-Hazardous Alternative
2. CLS-1 Waste Minimization/Mitigation Plan
3. Nuclear Reactor Fuel Reprocessing
4. Waste Characterization

Summary Tech Area ID: waste minimization

123 EXCEL

126 Supercritical Fluid Carbon Dioxide to Replace Chlorocarbon Solvents for Cleaning

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Plutonium

Target Site: Oak Ridge National Laboratory (X-10)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: retrieval
10 Sludge mobilization and transport

Target Site: Rocky Flats
BDAT: CHOXD
Summary Tech Area ID: waste destruction & stabilization
6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)
137 Catalytic Chemical Oxidation
365 Mediated Electrolytic Oxidation (MEO) Alternative (PNL)
BDAT: INCIN
Summary Tech Area ID: offgas technology
202 Real-Time Emission Monitoring
Summary Tech Area ID: waste destruction & stabilization
6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)
134 Thermal Treatment Process Unit/Fluidized Bed
137 Catalytic Chemical Oxidation
201 Packed-Bed Reactor/Silent Discharge Plasma (PBR/SDP)
365 Mediated Electrolytic Oxidation (MEO) Alternative (PNL)
BDAT: HLVIT
Summary Tech Area ID: final form
135 Microwave Solidification
BDAT: STABL
Summary Tech Area ID: final form
135 Microwave Solidification
136 Cement Solidification of Sludge, Salts and Ash (CTMP Compliance)

Target Site: Sandia National Laboratories (Albq)
BDAT: BIODG
Summary Tech Area ID: containment
198 Los Alamos Program for Barriers and Post Closure Monitoring
BDAT: STABL
Summary Tech Area ID: containment
198 Los Alamos Program for Barriers and Post Closure Monitoring

Target Site: Savannah River
BDAT: BIODG
Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment
BDAT: CHOXD
Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment
Summary Tech Area ID: waste destruction & stabilization
360 Destruction of HAZ/MIXED/TRU waste - organic material oxidation process
BDAT: INCIN
050 Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites;

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Off Gas Treatment
352 Off-gas treatment studies
353 Hazardous metals transport in incinerators
Summary Tech Area ID: waste destruction & stabilization
295 Cold Plasma Destruction of Savannah River Off-Gas VOCs
302 Pulsed Ultraviolet Irradiation Gas-Treatment Technology
313 High Energy Corona for Destruction of VOCs in Process Off-Gases
354 Rotary kiln seal tests
360 Destruction of HAZ/MIXED/TRU waste - organic material oxidation process

BDAT: WTRRX
Summary Tech Area ID: waste destruction & stabilization
350 Electron beam treatment of MLLW

BDAT: RMETL
Summary Tech Area ID: offgas technology
353 Hazardous metals transport in incinerators

BDAT: HLVIT
Summary Tech Area ID: final form
349 Immobilization studies

BDAT: STABL
Summary Tech Area ID: final form
349 Immobilization studies

BDAT: CARBN
Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: waste minimization
355 CIF related waste minimization activities

TABLE B-3

4695 CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

General Waste Matrix Category	Waste stream sets/with numbered subcategories (from SNL data call)	Matrix disposition	RCRA organic treatment	RCRA inorganic treatment
Aqueous liquids	2 Aqueous liquids	Evaporation, ion-exchange	WETOX, CHOXD, CARBN	PRECP, CHRED, RMERC, STABL

Target Site: Cross-complex

BDAT: BIODG

Summary Tech Area ID: chemical physical treatment

331 Biological Destruction of Tank Wastes

BDAT: CHOXD

Summary Tech Area ID: chemical physical treatment

15 Photocatalytic removal of complexed uranium from water

263 EIX Nitrate Destruction: Nitrate/Nitrite Destruction by Electrochemical Ion Exchange

Summary Tech Area ID: waste destruction & stabilization

44 Bremsstrahlung and Electron Beam Project

BDAT: CHRED

Summary Tech Area ID: chemical physical treatment

34 LDRD-Nitrate Destruction

119 Bio-catalytic Destruction of Nitrate and Nitrite

263 EIX Nitrate Destruction: Nitrate/Nitrite Destruction by Electrochemical Ion Exchange

284 Radioactive Sodium Nitrate Waste Treatment

BDAT: DEBRIS

Summary Tech Area ID: waste destruction & stabilization

226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR

BDAT: INCIN

Summary Tech Area ID: offgas technology

212 Sandia/Livermore Technology Specification for MWIP/OGT

Summary Tech Area ID: waste destruction & stabilization

226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR

BDAT: WETOX

Summary Tech Area ID: chemical physical treatment

15 Photocatalytic removal of complexed uranium from water

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

15 Photocatalytic removal of complexed uranium from water

38 Heavy Metal Removal by Electrodeposition

104 Magnetic separation

130 Surfactant Systems for Actinide Extraction/Encapsulation

168 UST: Cs Extraction Testing

217 Waste Separation and Pretreatment Using Titanate Ion Exchangers

239 UST: Truex Model Validation

267 Compact Processing Unit Demonstration

346 Reverse osmosis studies

348 Ion Exchange

379 Efficient Separation Processes Integrated Program - INSITU MAGNETICALLY-ASSISTED CHEMICAL SEPARATION

380 Efficient Separation Processes Integrated Program - Development of High Capacity

052

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Selective Fixed Sequestering Agents (Solid Sorbents for Selective Separation of Radioactive Nuclides)
383 Efficient Separation Processes Integrated Program - Derivatives of Natural Complexing Agents for Removal of Pu From Waste Waters
384 Efficient Separation Processes Integrated Program - Innovative Chemical Separation: Development and Testing of New Chemical Separations and Treatment Methods for Nuclear Waste Disposal

Summary Tech Area ID: final form
81 Liquid Metal Recycle and Waste Treatment

Summary Tech Area ID: offgas technology
212 Sandia/Livermore Technology Specification for MWIP/OGT

BDAT: RORGS

Summary Tech Area ID: chemical physical treatment
334 DECONTAMINATION OF PROCESS STREAMS/GROUNDWATER CONTAINING VOLATILE ORGANIC COMPOUNDS

BDAT: LLEXT

Summary Tech Area ID: chemical physical treatment
130 Surfactant Systems for Actinide Extraction/Encapsulation
239 UST: Truex Model Validation
374 Efficient Separation Processes Integrated Program - Aqueous biphasic systems
376 Efficient Separation Processes Integrated Program - Advanced solvent extraction/recovery processes

BDAT: HLVIT

Summary Tech Area ID: chemical physical treatment
258 Calcine Residue Leaching: High-Level Waste Volume Reduction for Calcine Processes

Summary Tech Area ID: final form
1 Ceramic Waste forms ANL
98 Chemically Bonded Ceramic Waste Forms

Summary Tech Area ID: offgas technology
212 Sandia/Livermore Technology Specification for MWIP/OGT

Summary Tech Area ID: waste destruction & stabilization
226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR

BDAT: STABL

Summary Tech Area ID: final form
1 Ceramic Waste forms ANL
98 Chemically Bonded Ceramic Waste Forms
240 Polyethylene Encapsulation of Low-Level Single Shell Tank Wastes

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization
75 Radiation-Based Mixed Waste Characterization.
110 Hydrocarbon Sensors
144 UST: Early Deployment System (EDS) - Robotic Characterization of UST
145 UST: Light Duty Utility Arm
148 UST: Light Duty Utility Arm Sampling End-Effector
164 DIAL - The Diagnostic Instrumentation and Analysis Laboratory
172 UST:SF211203 Raman Spectroscopy system
261 Waste Analysis with Laser Raman Spectroscopy

Summary Tech Area ID: characterization, monitoring & assay
20 Laser Induced Breakdown Spectroscopy

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Summary Tech Area ID: chemical physical treatment
74 Electrochemical Ion Exchange
Summary Tech Area ID: front end handling
185 Drum Opening, Emptying, and Transportation Systems
Summary Tech Area ID: other
161 UST: Waste Retrieval Project Coordination
265 Efficient Separations/Processes Integrated Program (ESPIP)--Coordination, Program Development, and Technology Evaluation Tasks.
Summary Tech Area ID: retrieval
142 UST: Excavation and Retrieval UST Wastes By Water Jets (Confined Sluicing)
143 UST: Wastes Dislodging Technology Development
147 UST: Waste Dislodging and Conveyance Technology
150 UST: Multi-Functional Scarifier/Conveyer: Design and Development of a Multifunction Scarifier End Effector with an Integral Conveyance System
151 UST: Hydraulics Technology: Hydraulics Technology in Support of Tank Waste Dislodging and Conveyance Systems Development
153 UST: Long Reach Arm - Control System
154 UST: Baseline Technologies for UST Remediation
155 UST: Long Reach Arm - Systems Coordination and Definition
156 UST: Light Duty Utility Arm - Laser Range Finder
157 UST: Long Reach Arm - Maintenance and Decontamination
158 UST: Light Duty Arm - Technical Interface
159 UST: Light Duty Utility Arm - Computer Interface/End Effector
160 UST: Long Reach Arm - Computer Interface
162 UST: Waste Dislodging
173 Storage Tanks-West: Long Reach Manipulator (LRM) System
174 Storage Tanks - East: Silo Waste Retrieval System (WRS) and Cost/Benefit Analysis
Summary Tech Area ID: system analysis
120 System Analysis
Summary Tech Area ID: waste destruction & stabilization
18 Ultrasonic Detoxification of Ground Water and Soil

Site-specific technology development activities with potential cross-complex applicability

Target Site: Argonne National Laboratory East

BDAT: RCORR
Summary Tech Area ID: chemical physical treatment
58 Technology Development for Concentrating Process Streams.

BDAT: RMETL
Summary Tech Area ID: chemical physical treatment
58 Technology Development for Concentrating Process Streams.
257 Resin Exchange
336 Processing of New Brunswick Laboratory Plutonium Wastes

BDAT: LLEXT
Summary Tech Area ID: chemical physical treatment
336 Processing of New Brunswick Laboratory Plutonium Wastes

BDAT: PRECP
Summary Tech Area ID: chemical physical treatment
337 Preparation of a Preliminary Waste Treatment Plan and Installation of a Filtration

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

System for nonTRU Mixed Waste

Target Site: Hanford

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

146 UST: Integrated Instrument Platform for In-Situ Characterization of Tank Wastes [new title pending]

Summary Tech Area ID: retrieval

149 UST: Simulants for Retrieval Tasks

Summary Tech Area ID: system analysis

264 UST: Tank Waste Processing Analysis

268 Advanced Chemical Separation: Simulation of Performance of Unit Operations and Systems of Such Operations proposed to effect Advanced Chemical Separation of Hanford Waste Streams

281 Comprehensive Sludge/Supernate DT&E

Target Site: Idaho

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

340 Treatment of mixed heavy metal waste

Summary Tech Area ID: final form

345 Treatment of sodium-bearing HLLW

BDAT: HLVIT

Summary Tech Area ID: final form

345 Treatment of sodium-bearing HLLW

BDAT: STABL

Summary Tech Area ID: final form

345 Treatment of sodium-bearing HLLW

Target Site: K-25/Y-12 Plant (Oak Ridge)

BDAT: HLVIT

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

BDAT: STABL

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

4 Compositional characterization OR LDR FFCA Treatment Development and Implementation, and

Target Site: Lawrence Livermore National Laboratory

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

39 UV/H2O2 Oxidation of MW

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

BDAT: HLVIT

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

BDAT: STABL

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

Target Site: Los Alamos National Laboratory

BDAT: CHOXD

Summary Tech Area ID: chemical physical treatment

23 Treatment of Electroplating Wastes.

BDAT: INCIN

Summary Tech Area ID: waste destruction & stabilization

87 Two-stage PBR/SDP for LLMW

414 Delphi DETOX

BDAT: RCORR

Summary Tech Area ID: chemical physical treatment

86 Nitric Acid Recycle

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

23 Treatment of Electroplating Wastes.

111 Extraction System for Removal of Radioactive and Hazardous Metal Ions From Aqueous Waste Streams.

113 Advanced Testing Line for Actinide Separations (ATLAS)

116 Water-soluble, Chelating Polymers for Toxic Metal-Ion Separation

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

127 Robotic NDA & Analytical Sample Characterization

Summary Tech Area ID: other

89
1. Replacement of Glovebox Gloves with Non-Hazardous Alternative
2. CLS-1 Waste Minimization/Mitigation Plan
3. Nuclear Reactor Fuel Reprocessing
4. Waste Characterization

Summary Tech Area ID: waste minimization

123 EXCEL

BDAT: NLDBR

Summary Tech Area ID: waste minimization

124 Hydrochloric Acid Recycle

Target Site: Rocky Flats

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)

BDAT: INCIN

Summary Tech Area ID: waste destruction & stabilization

6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)

BDAT: STABL

Summary Tech Area ID: final form

132 Cement Solidification (Solar Pond Cleanout)

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

136 Cement Solidification of Sludge, Salts and Ash (CTMP Compliance)
277 Polymer Solidification

Target Site: Sandia National Laboratories (Albq)

BDAT: BIODG

Summary Tech Area ID: containment
198 Los Alamos Program for Barriers and Post Closure Monitoring

BDAT: STABL

Summary Tech Area ID: containment
198 Los Alamos Program for Barriers and Post Closure Monitoring

Target Site: Savannah River

BDAT: BIODG

Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

Summary Tech Area ID: waste destruction & stabilization
305 Soil Bioreactor Studies

BDAT: CHOXD

Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

BDAT: INCIN

Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

BDAT: HLVIT

Summary Tech Area ID: final form
349 Immobilization studies

BDAT: STABL

Summary Tech Area ID: final form
349 Immobilization studies

BDAT: CARBN

Summary Tech Area ID: offgas technology
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

General Waste Matrix Category	Waste stream sets/with numbered subcategories (from SNL data call)	Matrix disposition	RCRA organic treatment	RCRA inorganic treatment
Organic solids, sludges and debris	**Homogeneous organic solids** 3 Organic sludges/ Particulates	Organic destruction, wash leach and recycle	INCIN, CHOXD, (applied to extract, wash or leachate)	STABL, RMERC (inorg. residue) CHRED, CARBN (aqueous washes, etc.)
	Organic Debris 6 Organic Debris	Extract, wash, leach, or immobilize and direct dispose as appropriate under debris rule	same - applied to extract, wash or leachate	

Target Site: Cross-complex

BDAT: BIODG

Summary Tech Area ID: containment

121 Barriers and Post-Closure Monitoring

Summary Tech Area ID: waste destruction & stabilization

115 Biodegradation of Organics in Mixed Wastes

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

44 Bremsstrahlung and Electron Beam Project

77 Electrocatalytic Destruction of Organic Waste and Treatment of Mixed Hazardous Wastes

369 SUPERCRITICAL WATER OXIDATION (SCWO) DEMONSTRATION PROGRAM

BDAT: CHRED

Summary Tech Area ID: chemical physical treatment

34 LDRD-Nitrate Destruction

BDAT: DEBRIS

Summary Tech Area ID: waste destruction & stabilization

226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR

BDAT: INCIN

Summary Tech Area ID: offgas technology

212 Sandia/Livermore Technology Specification for MWIP/OGT

Summary Tech Area ID: waste destruction & stabilization

29 Supercritical Water Oxidation-2

115 Biodegradation of Organics in Mixed Wastes

200 Waste Destruction and Stabilization Technology Specification

226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR

242 Arc Melter Vitrification: Melting and Vitrification of INEL Waste in the United States Bureau of Mines/ASME Municipal Ash Melter

259 Calcination Process Development to Treat Hanford's Tank Waste

275 Mixed Waste Destruction (Vitrification)

282 ORNL Program Support for MWIP (New Name: Plasma Design & Test)

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY
(Continued)

369 SUPERCRITICAL WATER OXIDATION (SCWO) DEMONSTRATION PROGRAM

BDAT: WETOX

Summary Tech Area ID: waste destruction & stabilization

29 Supercritical Water Oxidation-2

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

38 Heavy Metal Removal by Electrodeposition

104 Magnetic separation

109 Biological Approaches to Actinide Decontamination and Recovery.

379 Efficient Separation Processes Integrated Program - INSITU MAGNETICALLY-ASSISTED CHEMICAL SEPARATION

380 Efficient Separation Processes Integrated Program - Development of High Capacity Selective Fixed Sequestering Agents (Solid Sorbents for Selective Separation of Radioactive Nuclides)

382 ESPIP Selective Leaching of tank sludges by the ACT*DE*CON Process

383 Efficient Separation Processes Integrated Program - Derivatives of Natural Complexing Agents for Removal of Pu From Waste Waters

384 Efficient Separation Processes Integrated Program - Innovative Chemical Separation: Development and Testing of New Chemical Separations and Treatment Methods for Nuclear Waste Disposal

Summary Tech Area ID: offgas technology

212 Sandia/Livermore Technology Specification for MWIP/OGT

Summary Tech Area ID: waste destruction & stabilization

200 Waste Destruction and Stabilization Technology Specification

BDAT: LLEXT

Summary Tech Area ID: chemical physical treatment

376 Efficient Separation Processes Integrated Program - Advanced solvent extraction/recovery processes

BDAT: HLVIT

Summary Tech Area ID: final form

1 Ceramic Waste forms ANL

Summary Tech Area ID: offgas technology

212 Sandia/Livermore Technology Specification for MWIP/OGT

Summary Tech Area ID: other

92 Integral Fast Reactor Program, Pyroprocess Dev.

Summary Tech Area ID: waste destruction & stabilization

226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR

242 Arc Melter Vitrification: Melting and Vitrification of INEL Waste in the United States Bureau of Mines/ASME Municipal Ash Melter

275 Mixed Waste Destruction (Vitrification)

BDAT: STABL

Summary Tech Area ID: containment

121 Barriers and Post-Closure Monitoring

Summary Tech Area ID: final form

1 Ceramic Waste forms ANL

240 Polyethylene Encapsulation of Low-Level Single Shell Tank Wastes

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

75 Radiation-Based Mixed Waste Characterization.

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

110 Hydrocarbon Sensors
144 UST: Early Deployment System (EDS) - Robotic Characterization of UST
145 UST: Light Duty Utility Arm
148 UST: Light Duty Utility Arm Sampling End-Effector
164 DIAL - The Diagnostic Instrumentation and Analysis Laboratory
172 UST:SF211203 Raman Spectroscopy system
178 Contaminant Analysis Automation
187 Item Characterization and Sorting
192 Sensing Systems
261 Waste Analysis with Laser Raman Spectroscopy
318 In Situ Detection of Organics, Demo Support

Summary Tech Area ID: characterization, monitoring & assay
20 Laser Induced Breakdown Spectroscopy

Summary Tech Area ID: front end handling
185 Drum Opening, Emptying, and Transportation Systems

Summary Tech Area ID: monitoring
26 Integrated Manufacturing Design Initiative-LIBS

Summary Tech Area ID: other
161 UST: Waste Retrieval Project Coordination
265 Efficient Separations/Processes Integrated Program (ESPIP)--Coordination, Program Development, and Technology Evaluation Tasks.

Summary Tech Area ID: retrieval
142 UST: Excavation and Retrieval UST Wastes By Water Jets (Confined Sluicing)
143 UST: Wastes Dislodging Technology Development
147 UST: Waste Dislodging and Conveyance Technology
150 UST: Multi-Functional Scarifier/Conveyer: Design and Development of a Multifunction Scarifier End Effector with an Integral Conveyance System
151 UST: Hydraulics Technology: Hydraulics Technology in Support of Tank Waste Dislodging and Conveyance Systems Development
153 UST: Long Reach Arm - Control System
154 UST: Baseline Technologies for UST Remediation
155 UST: Long Reach Arm - Systems Coordination and Definition
156 UST: Light Duty Utility Arm - Laser Range Finder
157 UST: Long Reach Arm - Maintenance and Decontamination
158 UST: Light Duty Arm - Technical Interface
159 UST: Light Duty Utility Arm - Computer Interface/End Effector
160 UST: Long Reach Arm - Computer Interface
162 UST: Waste Dislodging
173 Storage Tanks-West: Long Reach Manipulator (LRM) System
174 Storage Tanks - East: Silo Waste Retrieval System (WRS) and Cost/Benefit Analysis

Summary Tech Area ID: system analysis
120 System Analysis
375 Efficient Separation Processes Integrated Program - Sludge Technology Assessment
378 Efficient Separation Processes Integrated Program - Technology Evaluation: Determine incentives and Data Needs for Demonstrating Pretreatment Technologies (formerly, Advanced Chemical Separations)

Summary Tech Area ID: waste destruction & stabilization
18 Ultrasonic Detoxification of Ground Water and Soil
177 Remote Size Reduction (RSR)

060

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Site-specific technology development activities with potential cross-complex applicability

Target Site: Fernald
BDAT: HLVIT
Summary Tech Area ID: waste destruction & stabilization
56 Minimum Additive Waste Stabilization (MAWS)

Target Site: Hanford

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
146 UST: Integrated Instrument Platform for In-Situ Characterization of Tank Wastes [new title pending]
Summary Tech Area ID: retrieval
149 UST: Simulants for Retrieval Tasks
Summary Tech Area ID: system analysis
264 UST: Tank Waste Processing Analysis
268 Advanced Chemical Separation: Simulation of Performance of Unit Operations and Systems of Such Operations proposed to effect Advanced Chemical Separation of Hanford Waste Streams
281 Comprehensive Sludge/Supernate DT&E
377 Efficient Separations Processes Integrated Program - Comprehensive Sludge/Supernate R&D

Target Site: Idaho
BDAT: HLVIT
Summary Tech Area ID: final form
344 Immobilization of calcine HLW
BDAT: MACRO
Summary Tech Area ID: final form
341 Lead macroencapsulation (Support of the Radioactive Waste Management Complex (RWMC))
BDAT: STABL
Summary Tech Area ID: final form
342 Sulfur polymer cement immobilization

Target Site: K-25/Y-12 Plant (Oak Ridge)
BDAT: HLVIT
Summary Tech Area ID: final form
9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation
BDAT: STABL
Summary Tech Area ID: final form
9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
4 Compositional characterization OR LDR FFCA Treatment Development and

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Implementation, and

Target Site: Lawrence Livermore National Laboratory

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

39 UV/H2O2 Oxidation of MW

BDAT: INCIN

Summary Tech Area ID: waste destruction & stabilization

3 Molten Salt Destruction of Hazardous and Mixed Wastes

25 Wet Oxidation C-21/Nuc. Ind.

33 Wet Oxidation of Ion Exchange Resins

BDAT: WETOX

Summary Tech Area ID: waste destruction & stabilization

25 Wet Oxidation C-21/Nuc. Ind.

33 Wet Oxidation of Ion Exchange Resins

BDAT: HLVIT

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

BDAT: STABL

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

65 Whole Barrel Survey and Segregation

Summary Tech Area ID: front end handling

32 Multiple Sensor Integration for Material Segregation-1

Summary Tech Area ID: robotics

64 Automated Glovebox Processing

122 Multiple Sensor Integration for Material Segregation-2

Target Site: Los Alamos National Laboratory

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

414 Delphi DETOX

BDAT: IMERC

Summary Tech Area ID: waste destruction & stabilization

414 Delphi DETOX

BDAT: INCIN

Summary Tech Area ID: waste destruction & stabilization

87 Two-stage PBR/SDP for LLMW

204 Electron-Beam Waste Treatment Test Bed

414 Delphi DETOX

BDAT: WETOX

Summary Tech Area ID: waste destruction & stabilization

414 Delphi DETOX

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

116 Water-soluble, Chelating Polymers for Toxic Metal-Ion Separation

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization
127 Robotic NDA & Analytical Sample Characterization
Summary Tech Area ID: waste minimization
94 Reuse, Recycling, and Decomposition of Calcium Chloride
123 EXCEL

Target Site: Oak Ridge National Laboratory (X-10)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: retrieval
10 Sludge mobilization and transport

Target Site: Rocky Flats

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization
6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)
137 Catalytic Chemical Oxidation
365 Mediated Electrolytic Oxidation (MEO) Alternative (PNL)

BDAT: INCIN

Summary Tech Area ID: offgas technology
202 Real-Time Emission Monitoring
Summary Tech Area ID: waste destruction & stabilization
6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)
134 Thermal Treatment Process Unit/Fluidized Bed
137 Catalytic Chemical Oxidation
365 Mediated Electrolytic Oxidation (MEO) Alternative (PNL)

BDAT: HLVIT

Summary Tech Area ID: final form
135 Microwave Solidification

BDAT: STABL

Summary Tech Area ID: final form
132 Cement Solidification (Solar Pond Cleanout)
135 Microwave Solidification
136 Cement Solidification of Sludge, Salts and Ash (CTMP Compliance)
277 Polymer Solidification

Target Site: Savannah River

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization
360 Destruction of HAZ/MIXED/TRU waste - organic material oxidation process

BDAT: INCIN

Summary Tech Area ID: offgas technology
352 Off-gas treatment studies
353 Hazardous metals transport in incinerators
Summary Tech Area ID: waste destruction & stabilization
295 Cold Plasma Destruction of Savannah River Off-Gas VOCs
354 Rotary kiln seal tests
360 Destruction of HAZ/MIXED/TRU waste - organic material oxidation process

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

359 Destruction of HAZ/MIXED/TRU waste - removing plutonium oxide

Summary Tech Area ID: offgas technology

353 Hazardous metals transport in incinerators

BDAT: HLVIT

Summary Tech Area ID: final form

349 Immobilization studies

BDAT: STABL

Summary Tech Area ID: final form

349 Immobilization studies

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

319 Fiber Optic Sensor and Analysis for the Integrated Demonstration for Cleanup of Soils and Groundwater in Non-Arid Sites

064

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY
(Continued)

General Waste Matrix Category	Waste stream sets/with numbered subcategories (from SNL data call)	Matrix disposition	RCRA organic treatment	RCRA inorganic treatment
Inorganic solids, sludges, soils and debris	**Homogeneous inorganic solids**			
	4 Inorganic sludges/ Particulates, 5 Cemented Solids	Extract, wash, leach, direct disposal	INCIN, CHOXD (applied to extract, wash or leachate)	STABL, RMERC (inorg. residue) CHRED, CARBN (aqueous washes, etc.)
	Soils 9 Soils with <50% Debris, 10 Soils	same	same	same
	Debris 7 Inorganic Debris, 8 Heterogeneous Debris	Extract, wash, leach, or immobilize and direct dispose as appropriate under debris rule	same	same

Target Site: Cross-complex

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

28 Supercritical Water Oxidation-1

BDAT: DEBRIS

Summary Tech Area ID: waste destruction & stabilization

226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR

BDAT: INCIN

Summary Tech Area ID: offgas technology

212 Sandia/Livermore Technology Specification for MWIP/OGT

Summary Tech Area ID: waste destruction & stabilization

28 Supercritical Water Oxidation-1

200 Waste Destruction and Stabilization Technology Specification

226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR

242 Arc Melter Vitrification: Melting and Vitrification of INEL Waste in the United States Bureau of Mines/ASME Municipal Ash Melter

275 Mixed Waste Destruction (Vitrification)

282 ORNL Program Support for MWIP (New Name: Plasma Design & Test)

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

38 Heavy Metal Removal by Electrodeposition

63 Aqueous Biphasic Treatment of Uranium Contaminated Soils

104 Magnetic separation

109 Biological Approaches to Actinide Decontamination and Recovery.

130 Surfactant Systems for Actinide Extraction/Encapsulation

379 Efficient Separation Processes Integrated Program - INSITU MAGNETICALLY-ASSISTED CHEMICAL SEPARATION

380 Efficient Separation Processes Integrated Program - Development of High Capacity Selective Fixed Sequestering Agents (Solid Sorbents for Selective Separation of Radioactive Nuclides)

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

381 Efficient Separation Processes Integrated Program - Calcine Residue Leaching: Volume Reduction for High Level Waste Sludges
383 Efficient Separation Processes Integrated Program - Derivatives of Natural Complexing Agents for Removal of Pu From Waste Waters
384 Efficient Separation Processes Integrated Program - Innovative Chemical Separation: Development and Testing of New Chemical Separations and Treatment Methods for Nuclear Waste Disposal

Summary Tech Area ID: final form
262 Magnetic and Nonmagnetic Melt/Slag Treatment of Mixed Wastes.

Summary Tech Area ID: offgas technology
212 Sandia/Livermore Technology Specification for MWIP/OGT

Summary Tech Area ID: waste destruction & stabilization
200 Waste Destruction and Stabilization Technology Specification

BDAT: LLEXT

Summary Tech Area ID: chemical physical treatment
130 Surfactant Systems for Actinide Extraction/Encapsulation
376 Efficient Separation Processes Integrated Program - Advanced solvent extraction/recovery processes

BDAT: HLVIT

Summary Tech Area ID: final form
1 Ceramic Waste forms ANL

Summary Tech Area ID: final form
227 BWID Final Waste Form Criteria (Treatment and Pre-treatment Waste Form Integration)

Summary Tech Area ID: offgas technology
212 Sandia/Livermore Technology Specification for MWIP/OGT

Summary Tech Area ID: other
92 Integral Fast Reactor Program, Pyroprocess Dev.

Summary Tech Area ID: waste destruction & stabilization
226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR
242 Arc Melter Vitrification: Melting and Vitrification of INEL Waste in the United States Bureau of Mines/ASME Municipal Ash Melter
275 Mixed Waste Destruction (Vitrification)

BDAT: STABL

Summary Tech Area ID: final form
1 Ceramic Waste forms ANL
227 BWID Final Waste Form Criteria (Treatment and Pre-treatment Waste Form Integration)
240 Polyethylene Encapsulation of Low-Level Single Shell Tank Wastes
262 Magnetic and Nonmagnetic Melt/Slag Treatment of Mixed Wastes.

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization
17 Quartz Crystal Microbalance (QCM) Arrays for Solution Analysis
75 Radiation-Based Mixed Waste Characterization.
110 Hydrocarbon Sensors
144 UST: Early Deployment System (EDS) - Robotic Characterization of UST
145 UST: Light Duty Utility Arm
148 UST: Light Duty Utility Arm Sampling End-Effector
164 DIAL - The Diagnostic Instrumentation and Analysis Laboratory
172 UST:SF211203 Raman Spectroscopy system

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY
(Continued)

175 Remote Characterization System (RCS)
178 Contaminant Analysis Automation
187 Item Characterization and Sorting
192 Sensing Systems
261 Waste Analysis with Laser Raman Spectroscopy

Summary Tech Area ID: front end handling

185 Drum Opening, Emptying, and Transportation Systems

Summary Tech Area ID: monitoring

26 Integrated Manufacturing Design Initiative-LIBS

Summary Tech Area ID: other

265 Efficient Separations/Processes Integrated Program (ESPIP)--Coordination, Program Development, and Technology Evaluation Tasks.

Summary Tech Area ID: retrieval

142 UST: Excavation and Retrieval UST Wastes By Water Jets (Confined Sluicing)
143 UST: Wastes Dislodging Technology Development
147 UST: Waste Dislodging and Conveyance Technology
150 UST: Multi-Functional Scarifier/Conveyer: Design and Development of a Multifunction Scarifier End Effector with an Integral Conveyance System
151 UST: Hydraulics Technology: Hydraulics Technology in Support of Tank Waste Dislodging and Conveyance Systems Development
153 UST: Long Reach Arm - Control System
154 UST: Baseline Technologies for UST Remediation
155 UST: Long Reach Arm - Systems Coordination and Definition
156 UST: Light Duty Utility Arm - Laser Range Finder
157 UST: Long Reach Arm - Maintenance and Decontamination
158 UST: Light Duty Arm - Technical Interface
159 UST: Light Duty Utility Arm - Computer Interface/End Effector
160 UST: Long Reach Arm - Computer Interface
162 UST: Waste Dislodging
173 Storage Tanks-West: Long Reach Manipulator (LRM) System
174 Storage Tanks - East: Silo Waste Retrieval System (WRS) and Cost/Benefit Analysis
176 Remote Excavation System (RES)
228 BWID Retrieval Related Technologies

Summary Tech Area ID: system analysis

120 System Analysis
375 Efficient Separation Processes Integrated Program - Sludge Technology Assessment
378 Efficient Separation Processes Integrated Program - Technology Evaluation: Determine incentives and Data Needs for Demonstrating Pretreatment Technologies (formerly, Advanced Chemical Separations)

Summary Tech Area ID: waste destruction & stabilization

177 Remote Size Reduction (RSR)

Site-specific technology development activities with potential cross-complex applicability

Target Site: Fernald

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

410 Soil Washing Treatability Study

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY
(Continued)

BDAT: HLVIT
Summary Tech Area ID: waste destruction & stabilization
56 Minimum Additive Waste Stabilization (MAWS)
BDAT: PRECP
Summary Tech Area ID: chemical physical treatment
410 Soil Washing Treatability Study
BDAT: NEUTR
Summary Tech Area ID: chemical physical treatment
410 Soil Washing Treatability Study

Target Site: Hanford

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
146 UST: Integrated Instrument Platform for In-Situ Characterization of Tank Wastes [new title pending]
Summary Tech Area ID: retrieval
149 UST: Simulants for Retrieval Tasks
Summary Tech Area ID: system analysis
264 UST: Tank Waste Processing Analysis
268 Advanced Chemical Separation: Simulation of Performance of Unit Operations and Systems of Such Operations proposed to effect Advanced Chemical Separation of Hanford Waste Streams
281 Comprehensive Sludge/Supernate DT&E
377 Efficient Separations Processes Integrated Program - Comprehensive Sludge/Supernate R&D

Target Site: Idaho
BDAT: HLVIT
Summary Tech Area ID: chemical physical treatment
370 Pyrochemical Process for ICPP HLW Calcine
BDAT: MACRO
Summary Tech Area ID: final form
341 Lead macroencapsulation (Support of the Radioactive Waste Management Complex (RWMC))
BDAT: STABL
Summary Tech Area ID: final form
342 Sulfur polymer cement immobilization

Target Site: K-25/Y-12 Plant (Oak Ridge)
BDAT: DEBRIS
Summary Tech Area ID: chemical physical treatment
11 Thermal Desorption, LDR FFCA Treatment Development and Implementation
BDAT: RMERC
Summary Tech Area ID: chemical physical treatment
11 Thermal Desorption, LDR FFCA Treatment Development and Implementation
BDAT: RORGS
Summary Tech Area ID: chemical physical treatment
11 Thermal Desorption, LDR FFCA Treatment Development and Implementation
BDAT: HLVIT
Summary Tech Area ID: final form
9 Final Waste Form Stabilization, LDR FFCA Treatment Development and

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Implementation

BDAT: STABL

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

4 Compositional characterization OR LDR FFCA Treatment Development and Implementation, and

Target Site: Lawrence Livermore National Laboratory

BDAT: HLVIT

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

BDAT: STABL

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

65 Whole Barrel Survey and Segregation

Summary Tech Area ID: front end handling

32 Multiple Sensor Integration for Material Segregation-1

Summary Tech Area ID: robotics

64 Automated Glovebox Processing

122 Multiple Sensor Integration for Material Segregation-2

Target Site: Los Alamos National Laboratory

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

105 Oxygen sparge of spent pyrochemical salts.

116 Water-soluble, Chelating Polymers for Toxic Metal-Ion Separation

BDAT: DEACT

Summary Tech Area ID: chemical physical treatment

105 Oxygen sparge of spent pyrochemical salts.

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: other

89
1. Replacement of Glovebox Gloves with Non-Hazardous Alternative
2. CLS-1 Waste Minimization/Mitigation Plan
3. Nuclear Reactor Fuel Reprocessing
4. Waste Characterization

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Target Site: Oak Ridge National Laboratory (X-10)

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: chemical physical treatment
12 Process to Salt Cake

Target Site: Rocky Flats
BDAT: INCIN
Summary Tech Area ID: offgas technology
202 Real-Time Emission Monitoring
BDAT: RORGS
Summary Tech Area ID: chemical physical treatment
138 Surface Organic Contaminant Removal
BDAT: LLEXT
Summary Tech Area ID: chemical physical treatment
138 Surface Organic Contaminant Removal
BDAT: HLVIT
Summary Tech Area ID: final form
135 Microwave Solidification
BDAT: STABL
Summary Tech Area ID: final form
132 Cement Solidification (Solar Pond Cleanout)
135 Microwave Solidification
277 Polymer Solidification

Target Site: Sandia National Laboratories (Albq)
BDAT: BIODG
Summary Tech Area ID: containment
198 Los Alamos Program for Barriers and Post Closure Monitoring
BDAT: STABL
Summary Tech Area ID: containment
198 Los Alamos Program for Barriers and Post Closure Monitoring

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA
Summary Tech Area ID: characterization
273 On-site Analysis of Metals Using ASV
Summary Tech Area ID: characterization Hg,Pb,Cr,As,Sb,Cd
272 Detection and Quantification of High-Z metals with X-Ray Fluorescence

Target Site: Savannah River
BDAT: BIODG
Summary Tech Area ID: waste destruction & stabilization
305 Soil Bioreactor Studies
321 TCE/PCE VEGETATION DEMONSTRATION
BDAT: INCIN
Summary Tech Area ID: offgas technology
352 Off-gas treatment studies
353 Hazardous metals transport in incinerators
Summary Tech Area ID: waste destruction & stabilization
354 Rotary kiln seal tests

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

359 Destruction of HAZ/MIXED/TRU waste - removing plutonium oxide

Summary Tech Area ID: offgas technology

353 Hazardous metals transport in incinerators

BDAT: HLVIT

Summary Tech Area ID: final form

167 Waste Form and Vitrification Process Development for Mixed Waste

349 Immobilization studies

BDAT: MACRO

Summary Tech Area ID: final form

358 Lead Macroencapsulation

BDAT: STABL

Summary Tech Area ID: final form

167 Waste Form and Vitrification Process Development for Mixed Waste

349 Immobilization studies

356 Waste form for CIF Ash

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

General Waste Matrix Category	Waste stream sets/with numbered subcategories (from SNL data call)	Matrix disposition	RCRA organic treatment	RCRA inorganic treatment
Other wastes	**Lab Packs** 11 Lab Packs with Metal, 12 Lab Packs without Metal	Extract, wash, leach, or immobilize and direct dispose	INCIN, CHOXD (applied to extract, wash or leachate)	STABL, RMERC, CHRED, RMETL
	Reactive/dangerous 13 Reactive Metals, 14 Explosives, 15 Compressed Gases	same	DEACT, WTRRX, RCGAS, ADGAS	STABL, DEACT
	Inherently hazardous 16 Liquid Mercury, 17 Elemental Lead, 18 Beryllium Dust, 19 Batteries			AMLGM, MACRO, HLVIT, RTHRM, Recycle
	Misc. Other 99 Other	(Varies)		

Target Site: Cross-complex

BDAT: BIODG

Summary Tech Area ID: chemical physical treatment

331 Biological Destruction of Tank Wastes

BDAT: CHOXD

Summary Tech Area ID: waste destruction & stabilization

44 Bremsstrahlung and Electron Beam Project

BDAT: CHRED

Summary Tech Area ID: chemical physical treatment

119 Bio-catalytic Destruction of Nitrate and Nitrite

BDAT: INCIN

Summary Tech Area ID: offgas technology

212 Sandia/Livermore Technology Specification for MWIP/OGT

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

38 Heavy Metal Removal by Electrodeposition

217 Waste Separation and Pretreatment Using Titanate Ion Exchangers

Summary Tech Area ID: final form

262 Magnetic and Nonmagnetic Melt/Slag Treatment of Mixed Wastes.

Summary Tech Area ID: offgas technology

212 Sandia/Livermore Technology Specification for MWIP/OGT

BDAT: LLEXT

Summary Tech Area ID: chemical physical treatment

374 Efficient Separation Processes Integrated Program - Aqueous biphasic systems

BDAT: HLVIT

Summary Tech Area ID: final form

1 Ceramic Waste forms ANL

98 Chemically Bonded Ceramic Waste Forms

293 Buried Waste Integrated Demonstration Thermal Kinetic Process Studies

Summary Tech Area ID: offgas technology

212 Sandia/Livermore Technology Specification for MWIP/OGT

Summary Tech Area ID: other

92 Integral Fast Reactor Program, Pyroprocess Dev.

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

252 Integral Fast Reactor Program, Pyroprocess Development

BDAT: STABL

Summary Tech Area ID: final form

1 Ceramic Waste forms ANL
98 Chemically Bonded Ceramic Waste Forms
240 Polyethylene Encapsulation of Low-Level Single Shell Tank Wastes
262 Magnetic and Nonmagnetic Melt/Slag Treatment of Mixed Wastes.

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

197 Noninvasive Site Characterization, Phase 2: Program Plan for Assessing and Integrating Space, Airborne and Surface Methods

Summary Tech Area ID: characterization, monitoring & assay

20 Laser Induced Breakdown Spectroscopy

Summary Tech Area ID: offgas technology

27 Integrated Manufacturing Design Initiative-Metal Emissions Monitoring

BDAT: NLDBR

Summary Tech Area ID: other

252 Integral Fast Reactor Program, Pyroprocess Development

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: system analysis

120 System Analysis

Site-specific technology development activities with potential cross-complex applicability

Target Site: Argonne National Laboratory East

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

257 Resin Exchange

Target Site: Idaho

BDAT: AMLGM

Summary Tech Area ID: chemical physical treatment

339 Elemental mercury amalgamation

BDAT: STABL

Summary Tech Area ID: final form

343 Iron enriched basalt (IEB) waste forms and processing

Target Site: K-25/Y-12 Plant (Oak Ridge)

BDAT: HLVIT

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

BDAT: STABL

Summary Tech Area ID: final form

9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

TABLE B-3

4695 SS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Target Site: Lawrence Livermore National Laboratory

BDAT: HLVIT

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

BDAT: STABL

Summary Tech Area ID: final form

40 Ceramic Waste Forms LLNL

69 Immobilization of Wastes in Ceramics

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

65 Whole Barrel Survey and Segregation

Summary Tech Area ID: robotics

64 Automated Glovebox Processing

Target Site: Los Alamos National Laboratory

BDAT: CHOXD

Summary Tech Area ID: chemical physical treatment

22 Oxidation process for depleted uranium

23 Treatment of Electroplating Wastes.

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

23 Treatment of Electroplating Wastes.

BDAT: HLVIT

Summary Tech Area ID: final form

416 CAI Vitrification

BDAT: STABL

Summary Tech Area ID: chemical physical treatment

22 Oxidation process for depleted uranium

Summary Tech Area ID: final form

416 CAI Vitrification

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: other

89
1. Replacement of Glovebox Gloves with Non-Hazardous Alternative
2. CLS-1 Waste Minimization/Mitigation Plan
3. Nuclear Reactor Fuel Reprocessing
4. Waste Characterization

BDAT: NLDBR

Summary Tech Area ID: waste minimization

108 Automated Retirement and Integrated Extraction System (ARIES)

Target Site: Rocky Flats

BDAT: INCIN

Summary Tech Area ID: offgas technology

202 Real-Time Emission Monitoring

BDAT: STABL

Summary Tech Area ID: final form

277 Polymer Solidification

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Target Site: Sandia National Laboratories (Albq)

BDAT: STABL

Summary Tech Area ID: containment

207 Geochemical Controls on Chromium Mobility

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

218 Neutron Activation Logging System for the MWLID

273 On-site Analysis of Metals Using ASV

Summary Tech Area ID: characterization Hg,Pb,Cr,As,Sb,Cd

272 Detection and Quantification of High-Z metals with X-Ray Fluorescence

Target Site: Savannah River

BDAT: BIODG

Summary Tech Area ID: offgas technology

328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

BDAT: CHOXD

Summary Tech Area ID: offgas technology

328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

BDAT: INCIN

Summary Tech Area ID: offgas technology

328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

352 Off-gas treatment studies

353 Hazardous metals transport in incinerators

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment

359 Destruction of HAZ/MIXED/TRU waste - removing plutonium oxide

Summary Tech Area ID: offgas technology

353 Hazardous metals transport in incinerators

BDAT: HLVIT

Summary Tech Area ID: final form

349 Immobilization studies

351 Waste form evaluation

BDAT: MACRO

Summary Tech Area ID: final form

351 Waste form evaluation

358 Lead Macroencapsulation

BDAT: STABL

Summary Tech Area ID: chemical physical treatment

357 Silver saddle treatment

Summary Tech Area ID: final form

349 Immobilization studies

351 Waste form evaluation

356 Waste form for CIF Ash

BDAT: CARBN

Summary Tech Area ID: offgas technology

328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

Crosscutting Technology Development Activities (not assigned to treatability groups)

Target Site: Cross-complex

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: retrieval
152 UST: Long Reach Arm-Kinematics
Summary Tech Area ID: robotics
182 SLM Software Design
188 Telerobot Improvements
189 Waste Processing Operations-Liaison to National Mixed Waste Programs
190 Waste Process Stream Handling System
191 Decontamination & Decommissioning
193 Controls
194 Systems Analysis
195 Mechanisms
196 University R&D Program
Summary Tech Area ID: storage
184 Remote Inspection and Survey of Stored Waste Drums

Target Site: K-25/Y-12 Plant (Oak Ridge)

BDAT: INCIN

Summary Tech Area ID: offgas technology
14 Cleanable steel HEPA filter

Target Site: Los Alamos National Laboratory

BDAT: RLEAD

Summary Tech Area ID: chemical physical treatment
85 Decontamination and Recycling of Lead Bricks

BDAT: RMETL

Summary Tech Area ID: chemical physical treatment
105 Oxygen sparge of spent pyrochemical salts.

BDAT: STABL

Summary Tech Area ID: chemical physical treatment
24 Controlled reaction of water-reactive wastes
85 Decontamination and Recycling of Lead Bricks

BDAT: DEACT

Summary Tech Area ID: chemical physical treatment
105 Oxygen sparge of spent pyrochemical salts.

BDAT: NEUTR

Summary Tech Area ID: chemical physical treatment
24 Controlled reaction of water-reactive wastes

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: analytical laboratories
181 EPA Validation of prototype individual SLMs
219 Analytical Service Program
385 National Sample Management and Tracking System

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

386 National Sample Management and Tracking System - RL
387 National Sample Management and Tracking System - AL
388 National Sample Management and Tracking System - RL
389 National Sample Management and Tracking System - SR
390 Methods Modification--Adapting SW-846 Methods for Mixed Waste Analysis
391 Methods Modification--Adapting SW-846 Methods to Mixed Waste Analysis
392 Methods Modification
393 Field Analyses Methods
394 Field Analyses
395 Quality Assurance Requirements Document
396 Performance Evaluation
397 Quality Assessment (Performance Evaluation Program)
398 Performance Evaluation Program
399 Audit Program
400 Audit Program
401 Analytical Cost Reduction (Blind Compliance)
402 Richland Operations Office Program Support Division
403 DQO Guidance Development
404 Interagency Agreement with the EPA Quality Assurance Management Staff
405 Interagency Agreement with the EPA Office of Radiation Programs
406 Interagency Agreement with the EPA Environmental Monitoring Systems Laboratory
407 Interagency Agreement with the EPA Environmental Monitoring Systems Laboratory
408 Interagency Agreement with the Analytical Operations Branch
409 MACTEC

Summary Tech Area ID: characterization

179 Testing and Modification of Standard Laboratory Modules (SLMs)/Standard Support Modules (SSMs)
180 Demonstration of remaining SLMs/SSMs for EPA 3540 & 3550
183 SLM Design for EPA Method Series 3000 SPM
220 BWID Non-Intrusive Sensing
230 BWID Remote Characterization System (RCS)
234 Improvements in Inductively Coupled Plasma Mass Spectrometry
236 Integrated Program - Characterization, Monitoring, and Sensor Technologies
237 Expedited Site Characterization: Application and Continued Development of Rapid, Focused Site Characterization Methodology for Federal Facilities
238 Optimization of Sampling Strategies
283 Problem-Directed Chemical Characterization - Rapid Response (Laser Rangefinder Add-On)
285 Associated Particle Imaging (API) Development
287 Remote Sensing Systems Development
300 3D, 1C/3C Seismic: Three-Dimensional, One- and Three-Component Reflection Seismic for Non-Intrusive Characterization of Environmental Restoration Sites
330 In Situ Secondary Ion Mass Spectrometry (SIMS) Analysis: Development and Evaluation of a Transportable Ion Trap SIMS Instrument for the Direct Analysis of Low Volatile Organic Compounds

Summary Tech Area ID: front end handling

186 AC Swing-Free Crane Control

Summary Tech Area ID: monitoring

280 Waste Stream Diagnostics and Control for Treatment of Mixed Waste

Summary Tech Area ID: other

271 PNL Technology Specification for MWIP

TABLE B-3

CROSS-COMPLEX TECHNOLOGY DEVELOPMENT TREATABILITY SUMMARY (Continued)

420 Tritium Gas Recovery/Recycle from Tritium Confinement Systems

Summary Tech Area ID: retrieval

221 BWID Retrieval Demonstration: End Effector Evaluation
222 BWID Contamination Control
223 BWID Dig Face Characterization
231 BWID Multiaxis Crane Control System
232 BWID Remote Excavating System (RES) Demonstration

Summary Tech Area ID: system analysis

415 Process Modeling-Mixed Waste Treatment

Summary Tech Area ID: waste minimization

418 Chip Collection System for Precision Machining

Target Site: Sandia National Laboratories (Albq)

BDAT: STABL

Summary Tech Area ID: containment

213 Dry Barriers Applications for Landfills

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: characterization

215 Magnetometer Towed Array

Summary Tech Area ID: containment

199 Migration Barrier Covers for Mixed Waste
203 A Prototype Decision Support System to Select MWL Barrier Cover Systems
210 Remedial Options Evaluation

Target Site: Savannah River

Technology development activities that do not link to specific BDAT RCRA treatment functions

BDAT: NA

Summary Tech Area ID: final form

413 Radiological Performance Assessment

APPENDIX B, SECTION BB

Technology Development (TD) Activity Indexed Narrative Descriptions

(note page numbers are designated differently from the preceding section of Appendix B, i. e., they are numbered BB-i, BB-1, etc.)

Appendix B, Section BB

BB. Technology Development (TD) Activity Indexed Narrative Descriptions

BB.1 Introduction

This portion of Appendix B presents numerically indexed narrative descriptions of the technology development activities supported by DOE in the area of mixed waste management. Earlier portions of Appendix B summarize site-specific technology development activities and cross-complex technology development activities. Mixed waste treatment requirements and the EM approach to technology development activities are summarized in Chapter 6. The site-specific technology development activities are also presented in detail in the individual site chapters.

This portion of Appendix B includes the following index lists and narrative descriptions. The narrative descriptions are presented in order of ascending ID (index) number.

BB.2 Index lists

1. Summary Index List - This list includes the ID number, technology development activity title, and the page number for the narrative description of that technology development activity.

2. Technology Development by Target Site - This list includes the ID number, and technology development activity title, grouped by target site. Cross Complex is used as the target site name for activities that are potentially applicable across the DOE complex, rather than supporting a specific target site. Specific site names are used as the target site name for activities which target site-specific needs.

3. Technology Development by BDAT - This list includes the ID number, and technology development activity title, grouped by BDAT category.

4. Technology Development by Summary Functional Area - This list includes the ID number, and technology development activity title, grouped by summary functional area.

BB.3 Narrative descriptions

The narrative descriptions for the technology development activity include:

Target site: Cross Complex or specific site name that the activity supports.

Location site: Site name where the work is performed

Programs/Facilities Supported: Cross Complex program or site-specific program or facilities that the activity supports.

ID: Database record number (index number)

Program Title: Technology development activity name.

Summary Description: Brief description including the scope of activity.

Summary Purpose/Need: A summary of the key ways that this technology development improves on the limitations of existing technology solutions, i.e., specific performance goals to improve the existing limitations, relationships to compliance agreement commitments, planned facilities, regulatory requirements, other drivers.

Summary Result/Endpoint/Deliverable: Identify what the result or endpoint of the activity will be, i.e., completed bench studies, pilot facilities, integrated prototype system, etc.

BDAT: The BDAT with which the technology development activity has been grouped.

Functional Areas: The functional areas with which the technology development activity has been grouped, at summary and more detailed levels.

Summary Index List

ID	Title	Page (BB-)
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3	Molten Salt Destruction of Hazardous and Mixed Wastes	2
4	Compositional characterization OR LDR FFCA Treatment Development and Implementation	3
6	Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)	4
9	Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation	5
10	Sludge mobilization and transport	6
11	Thermal Desorption, LDR FFCA Treatment Development and Implementation	7
12	Process to Salt Cake	8
14	Cleanable steel HEPA filter	9
15	Photocatalytic removal of complexed uranium from water	10
16	E-Beam Radiolysis of Simulated Hanford Waste	11
17	Quartz Crystal Microbalance (QCM) Arrays for Solution Analysis	12
18	Ultrasonic Detoxification of Ground Water and Soil	13
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Technology Development by Target Site

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16 E-Beam Radiolysis of Simulated Hanford Waste
17 Quartz Crystal Microbalance (QCM) Arrays for Solution Analysis
18 Ultrasonic Detoxification of Ground Water and Soil
20 Laser Induced Breakdown Spectroscopy
26 Integrated Manufacturing Design Initiative-LIBS
27 Integrated Manufacturing Design Initiative-Metal Emissions Monitoring
28 Supercritical Water Oxidation-1
29 Supercritical Water Oxidation-2
34 LDRD-Nitrate Destruction
38 Heavy Metal Removal by Electrodeposition
44 Bremsstrahlung and Electron Beam Project
63 Aqueous Biphasic Treatment of Uranium Contaminated Soils
74 Electrochemical Ion Exchange
75 Radiation-Based Mixed Waste Characterization.
77 Electrocatalytic Destruction of Organic Waste and Treatment of Mixed Hazardous Wastes
79 Controlled Air Incinerator
80 Microwave Fluidized Bed Detoxification of Mixed Waste
81 Liquid Metal Recycle and Waste Treatment
92 Integral Fast Reactor Program, Pyroprocess Dev.
98 Chemically Bonded Ceramic Waste Forms
102 Chemical Detoxification
104 Magnetic separation
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120 System Analysis
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130 Surfactant Systems for Actinide Extraction/Encapsulation
142 UST: Excavation and Retrieval UST Wastes By Water Jets (Confined Sluicing)
143 UST: Wastes Dislodging Technology Development
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408 Interagency Agreement with the Analytical Operations Branch
409 MACTEC
411 National Sample Management and Tracking System

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410 Soil Washing Treatability Study

Hanford

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377 Efficient Separations Processes Integrated Program - Comprehensive Sludge/Supernate R&D

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342 Sulfur polymer cement immobilization
343 Iron enriched basalt (IEB) waste forms and processing
344 Immobilization of calcine HLW
345 Treatment of sodium-bearing HLLW
370 Pyrochemical Process for ICPP HLW Calcine

K-25/Y-12 Plant (Oak Ridge)
4 Compositional characterization OR LDR FFCA Treatment Development and Implementation, and
9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation
11 Thermal Desorption, LDR FFCA Treatment Development and Implementation
14 Cleanable steel HEPA filter

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33 Wet Oxidation of Ion Exchange Resins
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3. Nuclear Reactor Fuel Reprocessing
4. Waste Characterization
94 Reuse, Recycling, and Decomposition of Calcium Chloride

105 Oxygen sparge of spent pyrochemical salts.
108 Automated Retirement and Integrated Extraction System (ARIES)
111 Extraction System for Removal of Radioactive and Hazardous Metal Ions From Aqueous Waste Streams.
113 Advanced Testing Line for Actinide Separations (ATLAS)
116 Water-soluble, Chelating Polymers for Toxic Metal-Ion Separation
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126 Supercritical Fluid Carbon Dioxide to Replace Chlorocarbon Solvents for Cleaning Plutonium
127 Robotic NDA & Analytical Sample Characterization
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416 CAI Vitrification
418 Chip Collection System for Precision Machining
419 Biodegradation of nitrated rags
420 Tritium Gas Recovery/Recycle from Tritium Confinement Systems

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10 Sludge mobilization and transport
12 Process to Salt Cake

Rocky Flats
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134 Thermal Treatment Process Unit/Fluidized Bed
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136 Cement Solidification of Sludge, Salts and Ash (CTMP Compliance)
137 Catalytic Chemical Oxidation
138 Surface Organic Contaminant Removal
201 Packed-Bed Reactor/Silent Discharge Plasma (PBR/SDP)
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277 Polymer Solidification
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321 TCE/PCE VEGETATION DEMONSTRATION
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment
349 Immobilization studies
350 Electron beam treatment of MLLW
351 Waste form evaluation
352 Off-gas treatment studies
353 Hazardous metals transport in incinerators
354 Rotary kiln seal tests
355 CIF related waste minimization activities
356 Waste form for CIF Ash
357 Silver saddle treatment
358 Lead Macroencapsulation
359 Destruction of HAZ/MIXED/TRU waste - removing plutonium oxide
360 Destruction of HAZ/MIXED/TRU waste - organic material oxidation process
413 Radiological Performance Assessment

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AMLGM
339 Elemental mercury amalgamation

BIODG
115 Biodegradation of Organics in Mixed Wastes
121 Barriers and Post-Closure Monitoring
198 Los Alamos Program for Barriers and Post Closure Monitoring
305 Soil Bioreactor Studies
321 TCE/PCE VEGETATION DEMONSTRATION
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment
331 Biological Destruction of Tank Wastes
419 Biodegradation of nitrated rags

CARBN
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

CHOXD
6 Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)
15 Photocatalytic removal of complexed uranium from water
22 Oxidation process for depleted uranium
23 Treatment of Electroplating Wastes.
28 Supercritical Water Oxidation-1
39 UV/H2O2 Oxidation of MW
44 Bremsstrahlung and Electron Beam Project
77 Electrocatalytic Destruction of Organic Waste and Treatment of Mixed Hazardous Wastes
80 Microwave Fluidized Bed Detoxification of Mixed Waste
102 Chemical Detoxification
137 Catalytic Chemical Oxidation
263 EIX Nitrate Destruction: Nitrate/Nitrite Destruction by Electrochemical Ion Exchange
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment
360 Destruction of HAZ/MIXED/TRU waste - organic material oxidation process
365 Mediated Electrolytic Oxidation (MEO) Alternative PNL
369 SUPERCRITICAL WATER OXIDATION (SCWO) DEMONSTRATION PROGRAM
414 Delphi DETOX

CHRED
34 LDRD-Nitrate Destruction
119 Bio-catalytic Destruction of Nitrate and Nitrite
263 EIX Nitrate Destruction: Nitrate/Nitrite Destruction by Electrochemical Ion Exchange
284 Radioactive Sodium Nitrate Waste Treatment

DEACT
105 Oxygen sparge of spent pyrochemical salts.

DEBRIS

11	Thermal Desorption, LDR FFCA Treatment Development and Implementation
226	BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR

HLVIT

1	Ceramic Waste forms ANL
9	Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation
40	Ceramic Waste Forms LLNL
56	Minimum Additive Waste Stabilization (MAWS)
69	Immobilization of Wastes in Ceramics
92	Integral Fast Reactor Program, Pyroprocess Dev.
98	Chemically Bonded Ceramic Waste Forms
135	Microwave Solidification
167	Waste Form and Vitrification Process Development for Mixed Waste
212	Sandia/Livermore Technology Specification for MWIP/OGT
226	BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR
227	BWID Final Waste Form Criteria (Treatment and Pre-treatment Waste Form Integration)
242	Arc Melter Vitrification: Melting and Vitrification of INEL Waste in the United States Bureau of Mines/ASME Municipal Ash Melter
252	Integral Fast Reactor Program, Pyroprocess Development
258	Calcine Residue Leaching: High-Level Waste Volume Reduction for Calcine Processes
275	Mixed Waste Destruction (Vitrification)
293	Buried Waste Integrated Demonstration Thermal Kinetic Process Studies
344	Immobilization of calcine HLW
345	Treatment of sodium-bearing HLLW
349	Immobilization studies
351	Waste form evaluation
370	Pyrochemical Process for ICPP HLW Calcine
416	CAI Vitrification

IMERC

414	Delphi DETOX

INCIN

3	Molten Salt Destruction of Hazardous and Mixed Wastes
6	Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)
14	Cleanable steel HEPA filter
16	E-Beam Radiolysis of Simulated Hanford Waste
25	Wet Oxidation C-21/Nuc. Ind.
28	Supercritical Water Oxidation-1
29	Supercritical Water Oxidation-2
33	Wet Oxidation of Ion Exchange Resins
79	Controlled Air Incinerator
80	Microwave Fluidized Bed Detoxification of Mixed Waste
87	Two-stage PBR/SDP for LLMW
88	Unvented Thermal Process for Treatment of ANL Mixed Waste
115	Biodegradation of Organics in Mixed Wastes
117	Ultrasonic Detoxification of Groundwater and Soil
128	Hydrothermal processing
134	Thermal Treatment Process Unit/Fluidized Bed
137	Catalytic Chemical Oxidation

200 Waste Destruction and Stabilization Technology Specification
201 Packed-Bed Reactor/Silent Discharge Plasma (PBR/SDP)
202 Real-Time Emission Monitoring
204 Electron-Beam Waste Treatment Test Bed
212 Sandia/Livermore Technology Specification for MWIP/OGT
226 BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR
242 Arc Melter Vitrification: Melting and Vitrification of INEL Waste in the United States Bureau of Mines/ASME Municipal Ash Melter
259 Calcination Process Development to Treat Hanford's Tank Waste
275 Mixed Waste Destruction (Vitrification)
282 ORNL Program Support for MWIP (New Name: Plasma Design & Test)
295 Cold Plasma Destruction of Savannah River Off-Gas VOCs
302 Pulsed Ultraviolet Irradiation Gas-Treatment Technology
313 High Energy Corona for Destruction of VOCs in Process Off-Gases
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment
352 Off-gas treatment studies
353 Hazardous metals transport in incinerators
354 Rotary kiln seal tests
360 Destruction of HAZ/MIXED/TRU waste - organic material oxidation process
365 Mediated Electrolytic Oxidation (MEO) Alternative (PNL)
369 SUPERCRITICAL WATER OXIDATION (SCWO) DEMONSTRATION PROGRAM
414 Delphi DETOX

LLEXT
130 Surfactant Systems for Actinide Extraction/Encapsulation
138 Surface Organic Contaminant Removal
239 UST: Truex Model Validation
336 Processing of New Brunswick Laboratory Plutonium Wastes
374 Efficient Separation Processes Integrated Program - Aqueous biphasic systems
376 Efficient Separation Processes Integrated Program - Advanced solvent extraction/recovery processes

MACRO
341 Lead macroencapsulation (Support of the Radioactive Waste Management Complex (RWMC))
351 Waste form evaluation
358 Lead Macroencapsulation

NA
4 Compositional characterization OR LDR FFCA Treatment Development and Implementation
10 Sludge mobilization and transport
12 Process to Salt Cake
17 Quartz Crystal Microbalance (QCM) Arrays for Solution Analysis
18 Ultrasonic Detoxification of Ground Water and Soil
20 Laser Induced Breakdown Spectroscopy
26 Integrated Manufacturing Design Initiative-LIBS
27 Integrated Manufacturing Design Initiative-Metal Emissions Monitoring
32 Multiple Sensor Integration for Material Segregation-1
64 Automated Glovebox Processing
65 Whole Barrel Survey and Segregation
74 Electrochemical Ion Exchange

75 Radiation-Based Mixed Waste Characterization.
89 1. Replacement of Glovebox Gloves with Non-Hazardous Alternative
2. CLS-1 Waste Minimization/Mitigation Plan
3. Nuclear Reactor Fuel Reprocessing
4. Waste Characterization
94 Reuse, Recycling, and Decomposition of Calcium Chloride
107 Cost Savings Support to Mixed Waste Integrated Program
110 Hydrocarbon Sensors
120 System Analysis
122 Multiple Sensor Integration for Material Segregation-2
123 EXCEL
126 Supercritical Fluid Carbon Dioxide to Replace Chlorocarbon Solvents for Cleaning Plutonium
127 Robotic NDA & Analytical Sample Characterization
142 UST: Excavation and Retrieval UST Wastes By Water Jets (Confined Sluicing)
143 UST: Wastes Dislodging Technology Development
144 UST: Early Deployment System (EDS) - Robotic Characterization of UST
145 UST: Light Duty Utility Arm
146 UST: Integrated Instrument Platform for In-Situ Characterization of Tank Wastes [new title pending]
147 UST: Waste Dislodging and Conveyance Technology
148 UST: Light Duty Utility Arm Sampling End-Effector
149 UST: Simulants for Retrieval Tasks
150 UST: Multi-Functional Scarifier/Conveyer: Design and Development of a Multifunction Scarifier End Effector with an Integral Conveyance System
151 UST: Hydraulics Technology: Hydraulics Technology in Support of Tank Waste Dislodging and Conveyance Systems Development
152 UST: Long Reach Arm-Kinematics
153 UST: Long Reach Arm - Control System
154 UST: Baseline Technologies for UST Remediation
155 UST: Long Reach Arm - Systems Coordination and Definition
156 UST: Light Duty Utility Arm - Laser Range Finder
157 UST: Long Reach Arm - Maintenance and Decontamination
158 UST: Light Duty Arm - Technical Interface
159 UST: Light Duty Utility Arm - Computer Interface/End Effector
160 UST: Long Reach Arm - Computer Interface
161 UST: Waste Retrieval Project Coordination
162 UST: Waste Dislodging
164 DIAL - The Diagnostic Instrumentation and Analysis Laboratory
172 UST:SF211203 Raman Spectroscopy system
173 Storage Tanks-West: Long Reach Manipulator (LRM) System
174 Storage Tanks - East: Silo Waste Retrieval System (WRS) and Cost/Benefit Analysis
175 Remote Characterization System (RCS)
176 Remote Excavation System (RES)
177 Remote Size Reduction (RSR)
178 Contaminant Analysis Automation
179 Testing and Modification of Standard Laboratory Modules (SLMs)/Standard Support Modules (SSMs)
180 Demonstration of remaining SLMs/SSMs for EPA 3540 & 3550
181 EPA Validation of prototype individual SLMs
182 SLM Software Design
183 SLM Design for EPA Method Series 3000 SPM
184 Remote Inspection and Survey of Stored Waste Drums

185 Drum Opening, Emptying, and Transportation Systems
186 AC Swing-Free Crane Control
187 Item Characterization and Sorting
188 Telerobot Improvements
189 Waste Processing Operations-Liaison to National Mixed Waste Programs
190 Waste Process Stream Handling System
191 Decontamination & Decommissioning
192 Sensing Systems
193 Controls
194 Systems Analysis
195 Mechanisms
196 University R&D Program
197 Noninvasive Site Characterization, Phase 2: Program Plan for Assessing and Integrating Space, Airborne and Surface Methods
199 Migration Barrier Covers for Mixed Waste
203 A Prototype Decision Support System to Select MWL Barrier Cover Systems
210 Remedial Options Evaluation
215 Magnetometer Towed Array
218 Neutron Activation Logging System for the MWLID
219 Analytical Service Program
220 BWID Non-Intrusive Sensing
221 BWID Retrieval Demonstration: End Effector Evaluation
222 BWID Contamination Control
223 BWID Dig Face Characterization
228 BWID Retrieval Related Technologies
230 BWID Remote Characterization System (RCS)
231 BWID Multiaxis Crane Control System
232 BWID Remote Excavating System (RES) Demonstration
234 Improvements in Inductively Coupled Plasma Mass Spectrometry
236 Integrated Program - Characterization, Monitoring, and Sensor Technologies
237 Expedited Site Characterization: Application and Continued Development of Rapid, Focused Site Characterization Methodology for Federal Facilities
238 Optimization of Sampling Strategies
261 Waste Analysis with Laser Raman Spectroscopy
264 UST: Tank Waste Processing Analysis
265 Efficient Separations/Processes Integrated Program (ESPIP)--Coordination, Program Development, and Technology Evaluation Tasks.
268 Advanced Chemical Separation: Simulation of Performance of Unit Operations and Systems of Such Operations proposed to effect Advanced Chemical Separation of Hanford Waste Streams
271 PNL Technology Specification for MWIP
272 Detection and Quantification of High-Z metals with X-Ray Fluorescence
273 On-site Analysis of Metals Using ASV
280 Waste Stream Diagnostics and Control for Treatment of Mixed Waste
281 Comprehensive Sludge/Supernate DT&E
283 Problem-Directed Chemical Characterization - Rapid Response (Laser Rangefinder Add-On)
285 Associated Particle Imaging (API) Development
287 Remote Sensing Systems Development
300 3D, 1C/3C Seismic: Three-Dimensional, One- and Three-Component Reflection Seismic for Non-Intrusive Characterization of Environmental Restoration Sites
318 In Situ Detection of Organics, Demo Support

319 Fiber Optic Sensor and Analysis for the Integrated Demonstration for Cleanup of Soils and Groundwater in Non-Arid Sites
330 In Situ Secondary Ion Mass Spectrometry (SIMS) Analysis: Development and Evaluation of a Transportable Ion Trap SIMS Instrument for the Direct Analysis of Low Volatile Organic Compounds
355 CIF related waste minimization activities
375 Efficient Separation Processes Integrated Program - Sludge Technology Assessment
377 Efficient Separations Processes Integrated Program - Comprehensive Sludge/Supernate R&D
378 Efficient Separation Processes Integrated Program - Technology Evaluation: Determine incentives and Data Needs for Demonstrating Pretreatment Technologies (formerly, Advanced Chemical Separations)
385 National Sample Management and Tracking System
386 National Sample Management and Tracking System - RL
387 National Sample Management and Tracking System - AL
388 National Sample Management and Tracking System - RL
389 National Sample Management and Tracking System - SR
390 Methods Modification--Adapting SW-846 Methods for Mixed Waste Analysis
391 Methods Modification--Adapting SW-846 Methods to Mixed Waste Analysis
392 Methods Modification
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394 Field Analyses
395 Quality Assurance Requirements Document
396 Performance Evaluation
397 Quality Assessment (Performance Evaluation Program)
398 Performance Evaluation Program
399 Audit Program
400 Audit Program
401 Analytical Cost Reduction (Blind Compliance)
402 Richland Operations Office Program Support Division
403 DQO Guidance Development
404 Interagency Agreement with the EPA Quality Assurance Management Staff
405 Interagency Agreement with the EPA Office of Radiation Programs
406 Interagency Agreement with the EPA Environmental Monitoring Systems Laboratory
407 Interagency Agreement with the EPA Environmental Monitoring Systems Laboratory
408 Interagency Agreement with the Analytical Operations Branch
409 MACTEC
411 National Sample Management and Tracking System
413 Radiological Performance Assessment
415 Process Modeling-Mixed Waste Treatment
418 Chip Collection System for Precision Machining
420 Tritium Gas Recovery/Recycle from Tritium Confinement Systems

NEUTR
24 Controlled reaction of water-reactive wastes
410 Soil Washing Treatability Study

NLDBR
108 Automated Retirement and Integrated Extraction System (ARIES)
124 Hydrochloric Acid Recycle
252 Integral Fast Reactor Program, Pyroprocess Development

PRECP
337 Preparation of a Preliminary Waste Treatment Plan and Installation of a Filtration System for nonTRU Mixed Waste
410 Soil Washing Treatability Study

RCORR
58 Technology Development for Concentrating Process Streams.
86 Nitric Acid Recycle

RLEAD
85 Decontamination and Recycling of Lead Bricks

RMERC
11 Thermal Desorption, LDR FFCA Treatment Development and Implementation

RMETL
15 Photocatalytic removal of complexed uranium from water
23 Treatment of Electroplating Wastes.
38 Heavy Metal Removal by Electrodeposition
58 Technology Development for Concentrating Process Streams.
63 Aqueous Biphasic Treatment of Uranium Contaminated Soils
81 Liquid Metal Recycle and Waste Treatment
104 Magnetic separation
105 Oxygen sparge of spent pyrochemical salts.
109 Biological Approaches to Actinide Decontamination and Recovery.
111 Extraction System for Removal of Radioactive and Hazardous Metal Ions From Aqueous Waste Streams.
113 Advanced Testing Line for Actinide Separations (ATLAS)
116 Water-soluble, Chelating Polymers for Toxic Metal-Ion Separation
130 Surfactant Systems for Actinide Extraction/Encapsulation
168 UST: Cs Extraction Testing
200 Waste Destruction and Stabilization Technology Specification
212 Sandia/Livermore Technology Specification for MWIP/OGT
217 Waste Separation and Pretreatment Using Titanate Ion Exchangers
239 UST: Truex Model Validation
257 Resin Exchange
262 Magnetic and Nonmagnetic Melt/Slag Treatment of Mixed Wastes.
267 Compact Processing Unit Demonstration
336 Processing of New Brunswick Laboratory Plutonium Wastes
340 Treatment of mixed heavy metal waste
345 Treatment of sodium-bearing HLLW
346 Reverse osmosis studies
348 Ion Exchange
353 Hazardous metals transport in incinerators
359 Destruction of HAZ/MIXED/TRU waste - removing plutonium oxide
379 Efficient Separation Processes Integrated Program - INSITU MAGNETICALLY-ASSISTED CHEMICAL SEPARATION
380 Efficient Separation Processes Integrated Program - Development of High Capacity Selective Fixed Sequestering Agents (Solid Sorbents for Selective Separation of Radioactive Nuclides)
381 Efficient Separation Processes Integrated Program - Calcine Residue Leaching: Volume Reduction for High Level Waste Sludges
382 ESPIP Selective Leaching of tank sludges by the ACT*DE*CON Process

383 Efficient Separation Processes Integrated Program - Derivatives of Natural Complexing Agents for Removal of Pu From Waste Waters
384 Efficient Separation Processes Integrated Program - Innovative Chemical Separation: Development and Testing of New Chemical Separations and Treatment Methods for Nuclear Waste Disposal
410 Soil Washing Treatability Study

RORGS
11 Thermal Desorption, LDR FFCA Treatment Development and Implementation
138 Surface Organic Contaminant Removal
334 DECONTAMINATION OF PROCESS STREAMS/GROUNDWATER CONTAINING VOLATILE ORGANIC COMPOUNDS

STABL
1 Ceramic Waste forms ANL
9 Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation
22 Oxidation process for depleted uranium
24 Controlled reaction of water-reactive wastes
40 Ceramic Waste Forms LLNL
69 Immobilization of Wastes in Ceramics
85 Decontamination and Recycling of Lead Bricks
98 Chemically Bonded Ceramic Waste Forms
121 Barriers and Post-Closure Monitoring
132 Cement Solidification (Solar Pond Cleanout)
135 Microwave Solidification
136 Cement Solidification of Sludge, Salts and Ash (CTMP Compliance)
167 Waste Form and Vitrification Process Development for Mixed Waste
198 Los Alamos Program for Barriers and Post Closure Monitoring
207 Geochemical Controls on Chromium Mobility
213 Dry Barriers Applications for Landfills
227 BWID Final Waste Form Criteria (Treatment and Pre-treatment Waste Form Integration)
240 Polyethylene Encapsulation of Low-Level Single Shell Tank Wastes
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277 Polymer Solidification
342 Sulfur polymer cement immobilization
343 Iron enriched basalt (IEB) waste forms and processing
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349 Immobilization studies
351 Waste form evaluation
356 Waste form for CIF Ash
357 Silver saddle treatment
416 CAI Vitrification

WETOX
15 Photocatalytic removal of complexed uranium from water
25 Wet Oxidation C-21/Nuc. Ind.
29 Supercritical Water Oxidation-2
33 Wet Oxidation of Ion Exchange Resins
117 Ultrasonic Detoxification of Groundwater and Soil
414 Delphi DETOX

WTRRX

347 UV photolysis
350 Electron beam treatment of MLLW

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analytical laboratories

181 EPA Validation of prototype individual SLMs
219 Analytical Service Program
385 National Sample Management and Tracking System
386 National Sample Management and Tracking System - RL
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388 National Sample Management and Tracking System - RL
389 National Sample Management and Tracking System - SR
390 Methods Modification--Adapting SW-846 Methods for Mixed Waste Analysis
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characterization

4 Compositional characterization OR LDR FFCA Treatment Development and Implementation, and
17 Quartz Crystal Microbalance (QCM) Arrays for Solution Analysis
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144 UST: Early Deployment System (EDS) - Robotic Characterization of UST
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characterization Hg,Pb,Cr,As,Sb,Cd
272 Detection and Quantification of High-Z metals with X-Ray Fluorescence

characterization, monitoring & assay
20 Laser Induced Breakdown Spectroscopy

chemical physical treatment
11 Thermal Desorption, LDR FFCA Treatment Development and Implementation
12 Process to Salt Cake
15 Photocatalytic removal of complexed uranium from water
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containment
121 Barriers and Post-Closure Monitoring
198 Los Alamos Program for Barriers and Post Closure Monitoring
199 Migration Barrier Covers for Mixed Waste

203 A Prototype Decision Support System to Select MWL Barrier Cover Systems
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210 Remedial Options Evaluation
213 Dry Barriers Applications for Landfills

final form
1 Ceramic Waste forms ANL
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98 Chemically Bonded Ceramic Waste Forms
132 Cement Solidification (Solar Pond Cleanout)
135 Microwave Solidification
136 Cement Solidification of Sludge, Salts and Ash (CTMP Compliance)
167 Waste Form and Vitrification Process Development for Mixed Waste
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345 Treatment of sodium-bearing HLLW
349 Immobilization studies
351 Waste form evaluation
356 Waste form for CIF Ash
358 Lead Macroencapsulation
413 Radiological Performance Assessment
416 CAI Vitrification

front end handling
32 Multiple Sensor Integration for Material Segregation-1
185 Drum Opening, Emptying, and Transportation Systems
186 AC Swing-Free Crane Control

monitoring
26 Integrated Manufacturing Design Initiative-LIBS
280 Waste Stream Diagnostics and Control for Treatment of Mixed Waste

offgas technology
14 Cleanable steel HEPA filter
27 Integrated Manufacturing Design Initiative-Metal Emissions Monitoring
202 Real-Time Emission Monitoring
212 Sandia/Livermore Technology Specification for MWIP/OGT
328 Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment
352 Off-gas treatment studies
353 Hazardous metals transport in incinerators

other

89	1. Replacement of Glovebox Gloves with Non-Hazardous Alternative
	2. CLS-1 Waste Minimization/Mitigation Plan
	3. Nuclear Reactor Fuel Reprocessing
	4. Waste Characterization
92	Integral Fast Reactor Program, Pyroprocess Dev.
161	UST: Waste Retrieval Project Coordination
252	Integral Fast Reactor Program, Pyroprocess Development
265	Efficient Separations/Processes Integrated Program (ESPIP)--Coordination, Program Development, and Technology Evaluation Tasks.
271	PNL Technology Specification for MWIP
420	Tritium Gas Recovery/Recycle from Tritium Confinement Systems

retrieval

10	Sludge mobilization and transport
142	UST: Excavation and Retrieval UST Wastes By Water Jets (Confined Sluicing)
143	UST: Wastes Dislodging Technology Development
147	UST: Waste Dislodging and Conveyance Technology
149	UST: Simulants for Retrieval Tasks
150	UST: Multi-Functional Scarifier/Conveyer: Design and Development of a Multifunction Scarifier End Effector with an Integral Conveyance System
151	UST: Hydraulics Technology: Hydraulics Technology in Support of Tank Waste Dislodging and Conveyance Systems Development
152	UST: Long Reach Arm-Kinematics
153	UST: Long Reach Arm - Control System
154	UST: Baseline Technologies for UST Remediation
155	UST: Long Reach Arm - Systems Coordination and Definition
156	UST: Light Duty Utility Arm - Laser Range Finder
157	UST: Long Reach Arm - Maintenance and Decontamination
158	UST: Light Duty Arm - Technical Interface
159	UST: Light Duty Utility Arm - Computer Interface/End Effector
160	UST: Long Reach Arm - Computer Interface
162	UST: Waste Dislodging
173	Storage Tanks-West: Long Reach Manipulator (LRM) System
174	Storage Tanks - East: Silo Waste Retrieval System (WRS) and Cost/Benefit Analysis
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222	BWID Contamination Control
223	BWID Dig Face Characterization
228	BWID Retrieval Related Technologies
231	BWID Multiaxis Crane Control System
232	BWID Remote Excavating System (RES) Demonstration

robotics

64	Automated Glovebox Processing
122	Multiple Sensor Integration for Material Segregation-2
182	SLM Software Design
188	Telerobot Improvements
189	Waste Processing Operations-Liaison to National Mixed Waste Programs
190	Waste Process Stream Handling System
191	Decontamination & Decommissioning
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storage
184 Remote Inspection and Survey of Stored Waste Drums

system analysis
107 Cost Savings Support to Mixed Waste Integrated Program
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Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
Rocky Flats plant

ID: 1

Program Title: Ceramic Waste forms ANL

Summary Description:
The task will develop final waste forms for the residues from treatment of mixed wastes at Rocky Flats plant. The ceramics will be selected to provide a high durability waste form suitable for final disposal, with emphasis placed on high loading of waste and simplicity in processing. Waste streams identified by the Mixed Waste treatment program will be assessed to determine candidate ceramic phase assemblies for waste form production.

Summary Purpose/Need:
The waste streams treated by this technology are 1. (solid) reworked pondcrete, ashes from thermal treatment processes, sludges, TRU waste filter cakes and residues, Be wastes, treated wastes and 2. (liquid) high chloride wastes, nitrated salts, sulfates, and chlorides, organics, and slurries.

Performance goals are to maximize waste loading and waste form durability while minimizing disposal volume and system costs. This technology development activity also supports Hanford tank remediation and complies with their FFCA schedules and requirements.

Summary Result/Endpoint/Deliverable:
The deliverable is a set of ceramic synthesis processes which are correlated with specific waste streams. After these base line processes are selected the engineering development phase will be initiated.

BDAT: HLVIT STABL

Functional Areas: final form
final form glass

Target Site: Lawrence Livermore National Laboratory

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
LLNL MWTF, MWIP

ID: 3

Program Title: Molten Salt Destruction of Hazardous and Mixed Wastes

Summary Description:
The molten-salt destruction process converts the hazardous component of mixed waste into carbon dioxide and water. It concentrates the actinides in the molten salt, thus converting mixed wastes into low-level wastes. The off-gases are sent through standard clean-up. The salt is separated into carbonates, noncarbonate salts, and ash (comprising actinides), which are recycled, sent to LLW disposal, and recovered or stabilized, respectively. We used single-stage units on hazardous wastes and on high explosives, and we are currently experimenting with a two-stage unit for mixed wastes. Mixed wastes, reactive gases (e.g. oxygen, O2), and molten salts (sodium carbonate, Na2CO3) are combined at the melting point of the salt (700-900 C). The organic components of the mixed waste (e.g. acetone) burn to produce carbon dioxide (C02), steam and salts such as sodium chloride (NaCl).

Summary Purpose/Need:
Molten-salt destruction retains the advantages of incineration, such as high throughput, and avoids the disadvantages, such as large fugitive inventories of radionuclides and negative public perception. The process thus offers an alternative in which actinides will be contained within the molten salt, and which does not require wet scrubbers. This process is an alternative to incineration. Since the first stage operates at 700 C actinide volatility is kept low. Acid gases are scrubbed by the salts reducing the complexity of off-gas treatment.

Summary Result/Endpoint/Deliverable:
We are building a pilot-scale MWTP Facility using the two-stage process. A commercial company can subsequently build a commercial-scale facility.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
thermal treatment unit - high residue
alternative organic destruction - high concentration
alternative organic destruction - high concentration
alternative organic destruction - high concentration
alternative organic destruction - high concentration

111

Target Site: K-25/Y-12 Plant (Oak Ridge)

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
OR FFCA, OR MWTF, and general OR RCRA LDR requirements. MWTP.

ID: 4

Program Title: Compositional characterization OR LDR FFCA Treatment Development and Implementation, and

Summary Description:
The evaluation of waste data activity to be completed in FY94 will identify those waste streams that do not possess sufficient compositional information to proceed with treatability studies and technology development; these wastes will require additional compositional characterization. Applies to essentially all waste categories except solid process residues. Compositional characterization involves four activities: sampling and analysis plan preparation, sampling individual waste containers, analyses of the waste samples, and evaluation of the waste sample data.

Summary Purpose/Need:
Many of the compositional characterization technologies themselves are relatively mature. However, the program is to develop sampling and analysis plans and tailor the relatively mature technologies to the specific waste stream applications at OR. Methods identified (e.g., for heterogeneous wastes) could reduce analysis costs, and associated handling exposures. Additionally, benefits are anticipated if characterization identifies waste that has been mis-categorized as RCRA, or if characterization identifies existing treatment capabilities for some waste streams.

Summary Result/Endpoint/Deliverable:
The effort is intended to provide compositional characterization of the wastes, with the majority to be sampled and analyzed in FY93 and FY94, and the remaining balance to be completed by mid-FY95, to support deployment of the FY96 line item MWTF. This activity will support identification of treatment options for wastes, and the planning for the treatability study program.

BDAT: NA

Functional Areas: characterization
compositional characterization

Target Site: Rocky Flats

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
RFP LDR Compliance Program, LLNL Mixed Waste Treatment Facility (MWTF)

ID: 6

Program Title: Mediated Electrochemical Oxidation (MEO) of Mixed Wastes (LLNL)

Summary Description:
The Mediated Electrochemical Oxidation (MEO) process is one part of the Rocky Flats Plant Incineration Alternatives (IA) project. IA is investigating individual technologies for the destruction of mixed combustible waste to allow selection of the most promising incineration alternative technologies for cold pilot scale system demonstration. This activity uses DOE laboratories and commercial firms to evaluate possible technologies. FY93 activities are focused on the largest volume categories of combustible waste: cutting oils and solid combustibles. The laboratory or subcontractor will define the optimum operating parameters and rates of destruction for each combustible waste stream which apply to MEO. The laboratory or subcontractor will provide a formal report detailing the results of the experimental work, including a basic conceptual design for a cold demonstration of MEO. The conceptual design will include material/energy balances, and identification of secondary waste streams and their treatment requirements.

The MEO process uses an electrochemical reactor to oxidize a mediator (e.g. silver, Ag) in an electrolyte (e.g. nitric acid, HNO3). The oxidized mediator in turn oxidizes and destroys the organics in the electrolyte. Also the radioactive components of the mixed waste are rendered soluble by the mediator and can be removed from the solution with an ion exchange column for recovery or concentrated for burial.

Summary Purpose/Need:
The goals of this activity are to identify, develop, test and demonstrate the MEO process as an alternative to incineration for the treatment of RFP low-level mixed combustible wastes and for waste stream treatment across the complex. This activity is intended to meet the requirements of the Comprehensive Treatment and Management Plan (CTMP).

Summary Result/Endpoint/Deliverable:
- FY 93 development summary report - 9/93
- Data sufficient to allow comparison with other candidate technologies and down-select of the preferred technology.

BDAT: CHOXD INCIN

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration
primary organic destruction - low concentration
primary organic destruction - high concentration

112

Target Site: K-25/Y-12 Plant (Oak Ridge)

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
OR FFCA, OR MWTF, national MWTP

ID: 9

Program Title: Final Waste Form Stabilization, LDR FFCA Treatment Development and Implementation

Summary Description:
Stabilization is being developed for the mixed wastes covered in the LDR FFCA. Waste solidification using glass and microwave melter pilot scale systems are planned, as well as evaluation of other processes. Bench-scale tests will focus on mercury residues, calcium chloride/metal chlorides, insolubles from the chloride flowsheet, dried and undried sludges. While the national program is focusing on vitrification, this program will attempt to fill in the gaps with evaluations of polymers, sulfide cements, Na/Zr/P ceramics and grouting. The effort involves completion of site preparation, installation, and start-up and operation of the pilot scale system in FY95..

Summary Purpose/Need:
The program is to tailor the relatively mature technologies, (BDAT in some cases) to the specific waste stream applications at OR with an emphasis on the benefits of appropriate enhanced final waste forms. The tailored processes are expected to meet LDR requirements, and perform adequately based on treatability studies, literature search and past application experiences, but this is to be demonstrated for these specific waste stream applications.

Summary Result/Endpoint/Deliverable:
The effort involves documentation, equipment specification, site preparation and process designs, pilot system procurement and fabrication by FY95 to support deployment of the FY96 line item MWTF.

BDAT: HLVIT STABL

Functional Areas: final form
final form glass
final form-grout or macro-encapsulation
final form (mercury stabilization)

114

Target Site: Oak Ridge National Laboratory (X-10)

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
The development activities are scheduled to support the WHPP planned FY97 line item, and the new tanks FY94 line item.

ID: 10

Program Title: Sludge mobilization and transport

Summary Description:
A single point sluicer, which was used to transfer LLLW from the gunite storage tanks, and a submerged jet pump, which is being considered for waste transfer at many DOE facilities, will be tested for mixing and mobilizing sludge from LLLW generator and evaporator service tanks. A computer code being developed at Pacific Northwest Laboratories will be used to recommend operating parameters for suspending sludge in these tanks. The results will be confirmed using simulated waste in a 1/6- and near-full scale model of the evaporator tank Parameters to be evaluated include flow rates, mixing times, pump/jet placement, nozzle design, piping sizes, waste composition, etc. needed to mix and mobilize sludge.

Tests will also be performed in the existing slurry test loop to study pumping of non Newtonian slurries through pipelines to insure that pumps are adequately sized to avoid plugging of the LLLW transfer lines. Vendor-supplied in-line solids monitors will also be evaluated to determine if monitors can be installed to determine when tanks have been emptied of sludge and to monitor solids loadings during transport to avoid plugging on transfer lines.

Summary Purpose/Need:
When FFA-noncompliant LLLW tanks are removed from service over a ten year period beginning in 1992, they must be completely emptied prior to being transferred to the Environmental Restoration program for remediation. Development efforts are needed to determine methods to adequately mix, mobilize, and transfer the sludges from the generator tanks to the LLLW evaporator feed tank and through the evaporator system to LLLW storage tanks which meet FFA standards. These methods need to be demonstrated to insure that sludge transfer can be accomplished without plugging the LLLW transfer lines and evaporator feed tank discharge lines. The intent of the development is also to avoid addition of surfactants or other materials that would create additional problems in dealing with the waste materials, minimize addition of other materials to reduce the waste volumes generated in mobilization and removal, reduce personnel exposure, and ensure the ability to remove and transport the material via pipeline.

Summary Result/Endpoint/Deliverable:
One-sixth scale and near-full scale modeling of two technologies are planned this FY. The program is to tailor the technologies to the specific waste stream applications.

BDAT: NA

Functional Areas: retrieval

115

Target Site: K-25/Y-12 Plant (Oak Ridge)

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
OR FFCA, OR MWTF, national MWTP

ID: 11

Program Title: Thermal Desorption, LDR FFCA Treatment Development and Implementation

Summary Description:
Thermal Desorption is being evaluated for low temperature removal of mercury, PCBs and other organics from LDR mixed wastes. Mercury and volatile and semi-volatile organic removal from soils and sludges will be the primary objective for demonstration of this technology. However, debris contaminated with hazardous materials will also be examined. The effort involves completion of site preparation, installation, and start-up and operation of the pilot scale system in FY94.

Summary Purpose/Need:
The program is to tailor the BDAT process to the specific waste stream applications at OR. A key focus is the need to address the strict air and water release limits (virtually zero emissions). The tailored BDAT process is expected to meet LDR requirements based on treatability studies, e.g., mercury < 12 ppm; PCB < 2 ppm; trichlor., et al, essentially zero or non-detectable.

Summary Result/Endpoint/Deliverable:
The effort involves completion of site preparation, installation, and start-up and operation of the pilot scale system in FY94 to support deployment of the FY96 line item MWTF.

BDAT: RMERC RORGS DEBRIS

Functional Areas: chemical physical treatment
removal of problem constituents
mercury bakeout

Target Site: Oak Ridge National Laboratory (X-10)

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
The development activities are scheduled to support the planned WHPP FY97 line item.

ID: 12

Program Title: Process to Salt Cake

Summary Description:
One method of concentrating and solidifying these salts is through evaporative techniques. One characteristic of concentrated material of this sort is that the viscosity of the liquid rises significantly with increasing molarity. Fundamental engineering relationships show that the amount of heat transfer diminishes greatly with increasing viscosity. Literature sources indicate that use of a wiped film evaporator (WFE) would lessen viscosity effects to a significant degree. Since the sludges are to be solidified the WFE appears to be a candidate for the evaporative unit operation. It was also learned that WFEs were used extensively to concentrate radioactive waste.

Summary Purpose/Need:
ORNL has an ongoing need to process mixed waste consisting largely of thick calcium and magnesium hydroxide sludges and about four molar sodium nitrate supernate solutions. None of the waste can be disposed of or shipped off-site in its current condition. Approximately 500,000 gal of remote handled (RH) TRU liquids and sludges are currently stored in tanks at ORNL. Characterization studies have shown that these wastes contain Resource Conservation and Recovery Act (RCRA) contaminates and are, therefore, mixed wastes. The current generation rate of RH-TRU is approximately 20,000 gal/year. The current strategy is to process the existing inventory of LLLW through the Waste Handling and Packaging Plant (WHPP) to produce a salt cake for disposal at the Waste Isolation Pilot Plant (WIPP).

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, site preparation and process designs, pilot system procurement and fabrication.

BDAT: NA

Functional Areas: chemical physical treatment
evaporation
final form

Target Site: K-25/Y-12 Plant (Oak Ridge)

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
LLNL MWMF, EM50—generic application facilities using filters at present (no specific program/facility is supported at present.

ID: 14

Program Title: Cleanable steel HEPA filter

Summary Description:
LLNL has been developing a cleanable stainless steel HEPA (high-efficiency particulate air) filter to remove suspended particles from off-gas systems in DOE facilities. The filter uses a filter medium that is made from submicron stainless steel fibers that are sintered into a sheet. This new filter will greatly improve the reliability of air cleaning systems because the filter will not suffer the structural damage that occurs with the present glass HEPA filters. The glass HEPA filter may fail when the filter gets wet, hot, or over pressured. In contrast, the steep HEPA filter can withstand these adverse conditions and will thereby reduce the risk of radioactive contamination to workers, the public, and the environment.

Summary Purpose/Need:
The steel HEPA filter will save money in waste disposal costs each year because the filter can be repeatedly cleaned and reused. The present glass HEPA filter cannot be cleaned and is discarded after the filter is loaded. The filter is reusable and more reliable filter than glass filters; and has less worker exposure.

Summary Result/Endpoint/Deliverable:
This is an R&D effort which includes:
1. A demonstration of steel HEPA filter based on 2 μm.
2. Develop a new media for filter after which 3 prototype filters will be built and tested.
3. Developing pressures to make 1μm and 1/2 μm filters.
4. Demo of steel filter (2 μm) March 93; (1/2 μm) May 93; (3 filter units) September 93.
5. Optimization of total units and cleaning aspects beyond FY93 (reverse pulse air cleaning and other techniques).

BDAT: INCIN

Functional Areas: offgas technology
offgas cleanup
HEPA filter

Target Site: Cross Complex

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
Fernald uranium in soils ID A3.
CE–use of solar energy for water pollution treatment.

ID: 15

Program Title: Photocatalytic removal of complexed uranium from water

Summary Description:
When complexed with organic materials, radionuclides are extremely stable and thus difficult to remove from water using conventional techniques. Photocatalysis can break up the organic complex leaving the radionuclide accessible to removal.
The program is targeted at secondary waste treatment for the Fernald ID A3 which will produce citrate-chelated uranium.

Summary Purpose/Need:
It handles organometallic complexes and stable organic complexes of radionuclides. The process mineralizes organics while immobilizing metals and radionuclides onto an inorganic matrix. Output of the process is inorganic and can be vitrified or hot pressed and then disposed, resulting in a reduction of volume. Hot pressing is an improved waste form and potentially less expensive than vitrification.

Summary Result/Endpoint/Deliverable:
The effort involves production of an integrated prototype system for demonstration at Fernald.

BDAT: RMETL CHOXD WETOX

Functional Areas: chemical physical treatment
radionuclide removal

Target Site: Cross Complex

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
Supports inertial confinement fusion program. Applicable to Hanford waste storage tanks

ID: 16

Program Title: E-Beam Radiolysis of Simulated Hanford Waste

Summary Description:
Investigation of the use of electron beams for the destruction of organics (and possibly ferrocyanide) in Hanford waste storage tanks. This will effort allows separation of radioactive materials. Process may destroy both the organic material and ferrocyanide in one step instead of two.

Summary Purpose/Need:
This effort offers the destruction of organic materials in mixed waste without adding other chemicals. The method could also provide a reduction in volume. The process may destroy both the organic material and the ferrocyanide in one step instead of two. Process offers cold destruction of organics.

Summary Result/Endpoint/Deliverable:
R&D currently directed toward establishing dose requirements to permit more accurate cost estimates. Complete bench studies and pilot facilities. If sufficient funding is available, we will produce complete bench studies and pilot facilities, and demonstrate the destruction of simulated waste in fluid flow geometry.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
primary organic destruction - high concentration

Target Site: Cross Complex

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
Electroplating facility in 2400; possible application @ AS/KCD

ID: 17

Program Title: Quartz Crystal Microbalance (QCM) Arrays for Solution Analysis

Summary Description:
This effort involves the characterization and analysis of waste stream solutions using Quartz Crystal Microbalance (QCM) Arrays.

Summary Purpose/Need:
This method offers low cost and rapid analysis, it is applicable to liquids. The advantages of this method are 1) it is a small, lightweight and portable analytical device, 2) it offers real-time distributed monitoring when compared to miniaturized lab equipment. The method may be applicable to detecting heavy metals in liquid organics.

Summary Result/Endpoint/Deliverable:
Develop an array of 6 or more QCMs and demonstrate ability to provide on-line real-time solution analyses.

BDAT: NA

Functional Areas: characterization
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
Buried Waste Integrated Demo
VOCs in arid and nonarid soils IPS

ID: 18

Program Title: Ultrasonic Detoxification of Ground Water and Soil

Summary Description:
This effort involves the ultrasonic detoxification of ground water and soil in an attempt to remove TCE, CCl4 and other chlorinated hydrocarbons that have been previously discarded in open pits at many DOE sites in which the soil and ground water is now contaminated with these compounds.

Summary Purpose/Need:
Followup provide missing writeup.

Summary Result/Endpoint/Deliverable:
This effort includes a field demonstration of an integrated process in FY94. This demo will involve an enhanced bench scale system.

BDAT: NA

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 20

Program Title: Laser Induced Breakdown Spectroscopy

Summary Description:
Laser-induced breakdown spectroscopy (LIBS) involves focusing a laser pulse onto or into the sample. A small amount of the sample is ablated forming a small micro-plasma. Temperatures within the micro-plasma can reach 20,000K, light emissions from the atoms, ions and simple diatomic molecules are collected and analyzed. The result of the analysis is the atomic composition of the constituent materials. Sensitivities and precision are appropriate for the measurement of major, minor and trace constituents.

LIBS is a mature technology developed over the past ten years; it has a variety of applications, including: analysis of soil for Cr, Be and Pb; (2) analysis of aerosols and surfaces for beryllium and lead; (3) detection of uranium in flowing process streams; (4) analysis of lead in paint; (5) analysis of salt selections; and (6) the determination of RCRA metals at concentrations appropriate for screening or monitoring of materials. We have also developed laser ablation of particle filters with direct sample introduction into an inductively coupled spectrometer. This means of sample introduction eliminates time-consuming sample preparation. LIBS is compatible with any waste stream form.

Summary Purpose/Need:
LIBS has many advantages over competing technologies. The method combines ease of operation with rapid analysis of solids, liquids, and gases. Many elements can be detected at the parts-per-million level, and some can be detected at the parts-per-billion level. Further, all elements in the microplasma can be detected simultaneously. Small lasers (less than 2 lbs) possessing the necessary pulse energy and compact detection systems are available. In situ diagnostics may be possible: only optical access to the sample is required and fiber optics-laser analysis is under development.

Summary Result/Endpoint/Deliverable:
Funding of LIBS for application to DOE Waste Management Activities will result in a prototype device for field testing. Demonstration, testing and evaluation would be developed with detailed plan of work.

BDAT: NA

Functional Areas: characterization, monitoring & assay
characterization
monitoring
process control
continuous emission monitoring

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
EM Waste Management Program

ID: 22

Program Title: Oxidation process for depleted uranium

Summary Description:
Landfill of LL Waste (Depleted Uranium)

At present, reactive and ignitable DU chips are stored under fueled oil #2 at bench scale. A LANL developed bleach process to oxidize DU under controlled conditions exists. The treatment converts uranium metal to unreactive uranium oxide and the fine radioactive uranium oxide slurry must be immobilized in cement. A pilot plant large enough to treat the inventory has been designed. The effort involves obtaining NESHAP and CAT EX while simultaneously getting competitive bids for construction in '93. In '94, completed pilot plant campaign is expected. The development activities taking place at LANL, TA-50, Bldg. 37.

Summary Purpose/Need:
The program is to tailor the process developed by LANL using bleach to oxidize DU chips and turning stored under fuel oil #2. The proposed process has been tested on DU chips only. It is expected that this technology using bleach is easy to control and is likely to be more acceptable than incineration. A CAT EX is expected for pilot plant operation and EA may be required for routine treatment. No state air permit or RCRA part B modifications are required. While this is not a RCRA waste, it must be treated as such before landfilling.

Summary Result/Endpoint/Deliverable:
The effort involves obtaining NESHAP, CAT EX, and simultaneously getting competitive bidding for construction in '93. In '94, complete pilot plant campaign is expected and the new hazardous waste treatment facility will have this treatment in 1999.

BDAT: CHOXD STABL

Functional Areas: chemical physical treatment
radionuclide removal

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
CE Industrial Waste Reduction Program/Em Waste Management Program

ID: 23

Program Title: Treatment of Electroplating Wastes.

Summary Description:
Treatment of electroplating wastes that will be housed in the new hazardous waste treatment facility to be completed in 1998 is being developed. The RCRA components are F007 and F009 (cyanides) corrosive D002, various characteristic metals and depleted uranium up to 1 GPL. These wastes must be treated according to RCRA and no bench scale work is contemplated except possibly to determine the fate of uranium. A treatment unit, skid-mounted, has to be designed for operation in the future hazardous waste treatment facility and title 1 of this skid design has been started. Some electrodeposition of metals and electro-oxidation of cyanide has been tested at bench scale and tests will continue. RCRA part B permit modification, NESHAP and air are required. Routine treatment is expected from 1997 onwards. The development activity is taking place at LANL TA-50, Bldg. 37.

Summary Purpose/Need:
The program is to tailor a technology that is RCRA BDAT and will meet the regulations over the range of compositions in storage to treat electroplating wastes. Electro-deposition/oxidation prior to treatment would be used to reduce the volume of treated waste. Some solutions may contain organics requiring further treatment. This design is expected to permit treatment of most, if not all, low level mixed electroplating/acidic/basic solutions in storage. However, hard-to-oxidize organics if present, may limit applicability. Application of this technology will bring the waste streams into compliance, but a mixed waste landfill will be needed. Waste characterization is needed. As DU is present only up to 1 GPL, safety and engineering problems are not anticipated.

Summary Result/Endpoint/Deliverable:
A treatment unit, skid mounted, will be designed in '93. It is anticipated the N.M. EPA may take as long as 2 years to process the part B permit modification that will be needed. The construction will take place in '95, followed by testing in '96 - '97 period. Routine treatment is expected from the year 1997 onwards.

BDAT: CHOXD RMETL

Functional Areas: chemical physical treatment
radionuclide removal
primary organic destruction - high concentration

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
EM Waste Management Program

ID: 24

Program Title: Controlled reaction of water-reactive wastes

Summary Description:
Treatment of Water-reactive Wastes
Reactivity of lithium hydride and other water-reactive compounds/metals must be neutralized prior to disposal to a landfill to meet EPA regulations. Reactivity and ignitablity (D003 and D001) are the RCRA components involved. Solid DU ranging from chunky to very fine powder constitute radioactive components. Bench scale work has shown that 100% of the lithium hydride could be converted to the non-reactive hydroxide and reactions rates at different temperatures have been identified. However, other variables must be investigated. NESHAP and air, as well as RCRA Part B modifications are required. the development activity is taking place at LANL TA-50, Bldg. 37.

Summary Purpose/Need:
The procedure is to make a process that hydrates water-reactive wastes with a humid nitrogen stream and the objective is to define operating conditions and generate engineering data for the design and operation of a pilot treatment skid. The radioactive components will either: 1) be solidified in cement or 2) treated in the DU chips treatment skid or 3) sent to the radliquid waste treatment plant. This technology will result in the waste streams being in compliance and is expected to be applicable to most or all water-reactive wastes, low level, although this needs to be demonstrated.

Summary Result/Endpoint/Deliverable:
Bench work on lithium hydride will be completed and bench testing of processes of other water-reactive wastes will be undertaken. The design, construction and operation of a pilot plant will be finished by '96 and from 1997 onwards routine treatment is expected. The new hazardous waste treatment facility will house the treatment when completed in 1999.

BDAT: NEUTR STABL

Functional Areas: chemical physical treatment
other

Target Site: Lawrence Livermore National Laboratory

Location site: Lawrence Livermore National Laboratory

P[illegible]ns/Facilities Supported:
L[illegible] MWMF, Complex 21

ID: 25

Program Titl[illegible] Wet Oxidation C-21/Nuc. Ind.

Sum[illegible]ary D[illegible]iption:
We[illegible] Oxidat[illegible] treatment for Ion Exchange Resins and Porous Solids - C-21/Nuc. Ind.
Treatment [illegible]rous solids such as kim wipes, booties, other laboratory items and ion
exchange [illegible] using a wet oxidation process already in UK and Europe is being
proposed. [illegible] procedure will have to be modified for the different ion exchange resins of
interest he[illegible]e ion exchange resins do not have a RCRA component, but the porous
solids hav[illegible]inds of solvents. Pu or others constitute the radioactive components. No
unique en[illegible]ental and permittability considerations exist for this technology and
standard [illegible]ing in California is expected. The development activity is taking place in
Bldg [illegible]gh Bldg. 419 could be a future candidate.

Sum[illegible]ose/Need:
The [illegible] to tailor the wet oxidation process technology developed in the United
King[illegible]/day unit in UK in Europe) to treat porous solids and ion exchange resins.
The [illegible] a low temperature technology that does not volatize actinides and is
inher[illegible] and this approach is an alternative to incineration. All radioactive
cons[illegible]ould end up in residue and there should be little or no organic residue.
HEP. [illegible]r off-gas will be needed and the dried residue can be sent to WIPP or
elec[illegible]l processes to recover Pu.

Sum[illegible]lt/Endpoint/Deliverable:
The e[illegible]lves adapting the technology developed in the United Kingdom to DOE
needs [illegible]ding a pilot plant to demonstrate the application to the wastes discussed
earlier. [illegible]ped to have an operational system (depending on funding) by the end of FY
94.

BDAT: WETOX INCIN

Functiona[illegible] reas: waste destruction & stabilization
alternative organic destruction - high concentration

Target Site: Cross Complex

Location site: Sandia National Laboratories (Liv)

Programs/Facilities Supported:
Electroplating activities.
Any thermal treatment facilities.
Any treatment with gaseous effluent.

ID: 26

Program Title: Integrated Manufacturing Design Initiative-LIBS

Summary Description:
This project will develop an on-line monitoring system capable of detecting toxic metals in particulate gas waste streams at a sensitivity in the parts per billion. This would be particularly useful for the electroplating and waste incineration industry.

Summary Purpose/Need:
The purpose of this project is to provide on-site, real-time monitoring of gaseous waste streams for simultaneous detection of multiple toxic species. Possible benefits include monitoring for process control for waste incineration and other thermal-based treatment processes.

Summary Result/Endpoint/Deliverable:
This effort involves building and demonstrating a prototype that can simultaneously detect multiple toxic species this year.

BDAT: NA

Functional Areas: monitoring
process control
incinerator offgas

Target Site: Cross Complex

Location site: Sandia National Laboratories (Liv)

Programs/Facilities Supported:
Any incinerator, other thermal treatments, electroplating operations.

ID: 27

Program Title: Integrated Manufacturing Design Initiative-Metal Emissions Monitoring

Summary Description:
Laser spark spectroscopy is being developed to identify and quantify metal components in gaseous waste streams. This technology would provide the capability for on-line detection of toxic and radioactive metal contaminates in any gaseous stream subject to incineration, and could be used to monitor waste incineration processes.

Summary Purpose/Need:
The goal of this task is to improve the detection of toxic metals to concentrations of 10 mg/cm3 for non radioactive components, and to concentrations of 10 ug/cm3 for radioactive contaminants.

Summary Result/Endpoint/Deliverable:
The first field demonstration is planned for October 1993.

BDAT: NA

Functional Areas: offgas technology
process control

Target Site: Cross Complex

Location site: Sandia National Laboratories (Liv)

Programs/Facilities Supported:
Any organic waste streams.

ID: 28

Program Title: Supercritical Water Oxidation-1

Summary Description:

Scope: Build a Supercritical Water Oxidation pilot plant and demonstrate

Goal: Understand underlying kinetics, corrosion, etc.

Summary Purpose/Need:
Need: alternative to incineration
Purpose: provide that alternative
Advantages include: low temp, no NOx, no smoke stack, simple.

Summary Result/Endpoint/Deliverable:
Build and demonstrate pilot system.
Understand underlying kinetics, corrosion, etc.

BDAT: INCIN CHOXD

Functional Areas: waste destruction & stabilization
thermal treatment unit - high residue

Target Site: Cross Complex

Location site: Sandia National Laboratories (Liv)

Programs/Facilities Supported:
Candidate for use at Rocky Flats, INEL, Hanford and possibly Y-12.

ID: 29

Program Title: Supercritical Water Oxidation-2

Summary Description:
Supercritical water oxidation is being developed as a waste disposal technique for toxic organic compounds such as dyes, solvents, and explosives. This technique is competitive with incineration, and no nitroxides are generated because of the low temperatures used. Radioactive components (except carbon and hydrogen isotopes) precipitate out as salts.

Summary Purpose/Need:
Although the efficiency of the destruction of organic waste is better than 99.99%, problems with vessel corrosion and destructive chemical kinetics need to be solved.

Summary Result/Endpoint/Deliverable:
A pilot plant demonstration is planned for 1996.

BDAT: INCIN WETOX

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration

Target Site: Lawrence Livermore National Laboratory

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
LLNL MWMF, EM cross-complex

ID: 32

Program Title: Multiple Sensor Integration for Material Segregation-1

Summary Description:
The goal of this program is to develop advanced automation technologies for the identification and sorting of large numbers of solid and liquid waste containers. Sensor information will be coupled with remote viewing and manipulation robotics for disposal operations in hostile environments.

Summary Purpose/Need:
The integration of remote sensor technologies with robotics will allow safe and effective segregation of various combustible, metallic, and radioactive wastes.

Summary Result/Endpoint/Deliverable:
No information was given at this time.

BDAT: NA

Functional Areas: front end handling
sorting
robotics

Target Site: Lawrence Livermore National Laboratory

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
LLNL MWMF, cross-complex

ID: 33

Program Title: Wet Oxidation of Ion Exchange Resins

Summary Description:
The wet oxidation process oxidizes organic materials with hydrogen peroxide in the presence of catalysts (such as iron or copper), converting them to carbon dioxide and water. The process is already well developed in the U.K. for radioactive and hazardous wastes. We will adapt plant design and modify the operating protocol to apply wet oxidation to mixed waste in the U.S.

Summary Purpose/Need:
Unlike incineration, wet oxidation is carried out at relatively low temperature, eliminating formation of toxic, corrosive, and radioactive off-gases. The volume of radioactive waste is reduced, producing savings in transportation and disposal costs. Toxic compounds in hazardous wastes may be fully destroyed, allowing direct discharge of the clean products.

Summary Result/Endpoint/Deliverable:
The effort involves adapting the technology developed in the United Kingdom to DOE needs and building a pilot plant to demonstrate the application to the wastes discussed earlier. It is hoped to have an operational system (depending on funding) by the end of FY 94.

BDAT: WETOX INCIN

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration

Target Site: Cross Complex

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 34

Program Title: LDRD-Nitrate Destruction

Summary Description:
The goal of this project is to develop electrochemistry as a remediation step in the disposal of nitrate waste (nitric acid). In the presence of ammonium ion, nitrate can be reduced to nitrite, which then reacts instantly with the ammonium to form water and nitrogen gas. The advantages of this approach are that the reaction occurs at moderate temperatures, is easily controlled, and requires no catalyst.

Summary Purpose/Need:
Nitric acid, a caustic, hazardous waste, is an important component in many industrial processes. An effective disposal technology is needed.

Summary Result/Endpoint/Deliverable:
No information was given at this time.

BDAT: CHRED

Functional Areas: chemical physical treatment
material recycle

Target Site: Cross Complex

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
- Nuclear Material Renewable Energy
- Replace Electroplating Shop

ID: 38

Program Title: Heavy Metal Removal by Electrodeposition

Summary Description:
We are developing electrodeposition methods to remove heavy metals from waste electroplating solutions. We have designed and operated bench-scale cells that have reduced the silver (a RCRA metal) content in waste solutions from 0.5M to 0.2 ppm. We are now focusing on the removal of cobalt. Electrodeposition of metals has been known historically as electroplating and used for 150 years. The oxidation- reduction reactions at the electrodes are driven by a DC voltage. The plating occurs at the cathode where the metal ions are reduced to their zero-valence state. Electrochemical cells will plate lead, tin, nickel, chromium, zinc, and cadmium typically from acid solutions and silver, gold, copper, and cobalt from basic solutions with cyanide complexes. Often the metal plating can be stripped off the electrode mechanically and burned or oxidized before storage in concrete. Industry often recycles precious metals by electrodeposition. Materials used can be recycled.

Summary Purpose/Need:
Commercial process have been unable to remove heavy metals from waste electroplating solutions. Some heavy metals require special process and cell design, particularly if the allowable discharge limits are low. This work is applicable to aqueous and liquid waste streams containing heavy metals and to metals separated from aqueous streams and sludges. Competing technologies generally try to precipitate the heavy metal. For example ferric chloride will be used to precipitate the heavy metal as a hydroxide. But most of the sludge created will be ferric hydroxide. This electroplating process dramatically cuts the volume to be stored. To reduce the heavy metal concentrations to very low values (about 0.2 ppm) a porous cathode must be used which results in a deposit which cannot be mechanically stripped. This in turn leads to higher storage volumes. However one can use a 2-stage process and only use the porous electrode for final cleanup.

Summary Result/Endpoint/Deliverable:
This effort involves completion of a pilot plant to remove heavy metals from waste solutions. Electrode materials and electrolytes can be chosen for each heavy metal to be plated. The basic idea should be broadly applicable.

BDAT: RMETL

Functional Areas: chemical physical treatment
removal of problem constituents
lead treatment/recycle

Target Site: Lawrence Livermore National Laboratory

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:

Cross-complex, LLNL MWMF

ID: 39

Program Title: UV/H2O2 Oxidation of MW

Summary Description:
UV light photochemically decomposes H2O2 to produce OH radicals that are powerful oxidants capable of mineralizing organic compounds. As a result the organic compounds are oxidized to CO2, H2O, acids and anions, which are easily dealt with. The efficiency of the current process needs to be improved. We are studying the use of xenon flash lamps and excimer UV sources and are exploring the possibility of using dual-purpose sources, one for decomposing H2O2 and another for exciting the target organics to enhance their reaction rates.

Summary Purpose/Need:
Complete mineralization of organic compounds is needed in treating mixed waste. Process efficiency is important. The medium- to high-pressure mercury lamps commonly used in UV/H2O2 processes may not be the most efficient sources. UV/H2O2 is environmentally safe, is tolerant of a wide range of pH values, and operates at low temperature and pressure. Only benign chemical are added to the system; they do not produce any precipitates.

Summary Result/Endpoint/Deliverable:
This effort involves bench-scale studies for parametric investigations of efficiency vs. uv source and configuration, leading to pilot-scale conceptual designs.

BDAT: CHOXD

Functional Areas: waste destruction & stabilization
alternative organic destruction - low concentration

Target Site: Lawrence Livermore National Laboratory

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
LLNL MWMF, Rocky Flats Plant, Cross-complex

ID: 40

Program Title: Ceramic Waste Forms LLNL

Summary Description:
The task will develop final waste forms for the residues from treatment of mixed waste at Rocky Flats Plant. Waste streams identified by the Mixed Waste Treatment Program will be assessed to determine candidate ceramics for waste form preparation. The ceramics will be selected to provide a high-durability waste form suitability for disposal. Emphasis will be placed on high loading of waste and simplicity in processing. Synthesis alternatives will be examined to determine the least expensive and most reliable methods.

Summary Purpose/Need:
Residues from the treatment of mixed waste at Rocky Flats are not in a form suitable for disposal. We need to develop a high-quality, reliable ceramic waste form capable of high waste loading and volume reduction.

Summary Result/Endpoint/Deliverable:
This effort involves building and testing the first production-scale ceramic waste form line at Rocky Flats in 1995.

BDAT: STABL HLVIT

Functional Areas: final form
final form ceramic

Target Site: Cross Complex

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 44

Program Title: Bremsstrahlung and Electron Beam Project

Summary Description:
High energy electron beams and x-rays (Bremsstrahlung) have been demonstrated to be effective in the destruction of hazardous organic wastes, particularly chlorinated hydrocarbons. Ionizing radiation radiolytically decomposes halogenated hydrocarbons and other toxic compounds. The compounds are destroyed as by an incinerator but at ambient temperature. Experiments at LLNL used radiation to decompose volatile organic compounds (VOCs) and other substances. No toxic decomposition products were produced. Commercial electron accelerators can be used to decompose TCE. We tested four electron accelerators, which provided electrons possessing energies from 1.6 to 9 MeV and produced bremsstrahlung dose rates from 105 to 5 x 1011 R/s. Our vapor-phase system is now on a commercial scale. The liquid- and solid-phase systems are at the bench-scale stage. Recently an electron beam pilot plant capable of treating an aqueous hazardous waste stream has been developed by collaborators at Florida International University/University of Miami. This plant uses a 1.5 MeV electron accelerator with variable current up to 50 mA to produce doses in water approaching 1 MRad.

Summary Purpose/Need:
We need methods to treat VOCs, PCBs in oil, high explosives in aqueous solutions, and chemical weapon surrogates. Waste treatment by bremsstrahlung radiation destroys rather than collects hazardous components. This method is widely accepted by the public, gaining approval of the Sierra Club. Further, this method is effective even on unopened waste drums.

Summary Result/Endpoint/Deliverable:
The deliverables for this project are pilot-scale plants to demonstrate the efficacy of the technology.

BDAT: CHOXD

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration

4695

Target Site: Fernald

Location site: Fernald

Programs/Facilities Supported:
This project is intended to be the bench/pilot scale demonstration of vitrification technology.

ID: 56

Program Title: Minimum Additive Waste Stabilization (MAWS)

Summary Description:
The MAWS technology demonstration program is an integrated waste treatment system. Vitrification is the core technology which will be used for stabilization of waste sludges and other contaminated material. The process technology is integrated with soil washing to reduce the overall volume of the waste to be vitrified. Ion exchange will be used to treat contaminated water from the soil washing process. Another potential benefit of the integrated approach is to use the soil waste stream and other treatment residues as a raw material additive for the vitrification process. The ultimate goal of the MAWS program is to demonstrate the cost-effectiveness and feasibility of waste volume reduction by the integrated treatment process. The initial MAWS Bench-Scale Unit will treat Pit 5 sludges with FEMP soils.

Summary Purpose/Need:
Goals of this process are to minimize additives thereby reducing cost and volume as well as to produce a glass form that as a minimum passes the EPA leach test. In addition, it is expected that the vitrification process will be proven to effectively remove, or render nonleachable, organics for which the waste is listed, in order to allow delisting of the final glass form. The process is expected to handle the ranges of constituents anticipated. The amount of organics that can be destructed will be determined during delisting runs by spiking organics into materials to be vitrified. This is necessary since TCA has not been detected in Pit 5, but has been "listed" due to process knowledge. Destruction and removal efficiency (DRE) has not been discussed in detail, however, since the goal of vitrification is to provide a "delistable" final form, it is anticipated that DRE will be required to be greater than 99 percent.

Summary Result/Endpoint/Deliverable:
The end-point is a demonstration of the 300 Kg melter system at the Fernald site in FY 93. If chosen as the best treatment, additional funding for scaleup will be allocated.

BDAT: HLVIT

Functional Areas: waste destruction & stabilization
thermal treatment unit - high residue
final form glass

139

Target Site: Argonne National Laboratory East

Location site: Argonne National Laboratory East

Programs/Facilities Supported:
Argonne's Waste Management Operations

ID: 58

Program Title: Technology Development for Concentrating Process Streams.

Summary Description:
Waste and product solutions are being generated throughout the DOE complex. Evaporation of these stream minimizes and reduces disposal costs. The purpose of the program is to develop an evaporator for concentrating radioactive streams and recycling the acidic, decontaminated distillates. This program will take advantage of commercial evaporator advances over the past thirty years. The goal is to develop a remote, criticality-safe-by-geometry evaporator.

Summary Purpose/Need:
The purpose of the program is to develop an evaporator for concentrating radioactive streams and recycling the acidic, decontaminated distillates. High decontamination factors are a requirement for this equipment. Decontamination factors of 4,000,000 were achieved in the laboratory-scale evaporator. LICON designed evaporators have also been operated remotely in the commercial-sector. This is another requirement of this system. LICON's technology is state-of-the-art and is much improved over DOE's 30 year old evaporator technology. Design of an evaporator for this project is at the R&D design stage. The basic design is based on a commercially-available evaporator designed by LICON Inc. (Pensacola Florida).

Summary Result/Endpoint/Deliverable:
Activities this year will center around the design and installation of two low-level waste evaporators at ANL. Data from this evaporator will be used to design a remotely operable, criticality-safe-by-geometry pilot-scale evaporator. The pilot-scale unit will then be used to design a full-scale remotely operable, criticality-safe-by-geometry evaporator for installation at another DOE site for in-plant testing.

BDAT: RCORR RMETL

Functional Areas: chemical physical treatment
evaporation
material recycle

4695

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
Fernald cleanup, Uranium in Soils ID

ID: 63

Program Title: Aqueous Biphasic Treatment of Uranium Contaminated Soils

Summary Description:
The target is submicron particulates of actinide oxides (50 micron to 2 nm) that are chemically separated from a matrix of soil or ash, focused on the Fernald site. It could also be used to remove actinide particulates from sludges.

Aqueous biphasic extraction systems are being developed to treat radioactive wastes. The separation technique involves the selective partitioning of either solutes or colloid-size particles between two immiscible aqueous phases. Wet grinding of residues to an average particle size of one micron will be used to liberate the actinides from the bulk of the particle matrix. The goal is to produce an actinide concentrate that will integrate with existing and developing chemical recovery processes. Ideally, the process would produce a nonTRU waste stream. Coupling physical benefication with chemical processing will result in the volume of mixed wastes generated from dissolution recovery processes.

As part of this program, the applications of aqueous biphasic extraction that include the separation and recovery of dissolved species such as metal ions and water-soluble organics will be explored.

The expertise and data generated in this work will form the basis for developing more cost effective processes for handling waste streams from environmental restoration and waste management activities within the DOE community.

Summary Purpose/Need:
This project is part of the Uranium in Soils ID. The technology developed will demonstrate the removal of small particulates of actinides which are insoluble. These cannot currently be removed easily by other technologies.
This project supports the Fernald FFCA agreement.

Summary Result/Endpoint/Deliverable:
The end-point is an integrated demo at Fernald in FY 94, pilot facility with 500 kg batches of treated contaminated soil.

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal
removal of problem constituents

Target Site: Lawrence Livermore National Laboratory

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
LLNL MWMF, EM Cross-complex, supporting complex 21 Chemical Processes

ID: 64

Program Title: Automated Glovebox Processing

Summary Description:
Automated glovebox technologies (glovebox robotics, remote control of processes by teleoperations, and advanced material transfers) are being applied to priority waste processing. Extensive development efforts are ongoing for reliability and for remotely maintainable robotic systems that can be operated from adjacent, noncontaminated areas. Our current focus is purification and recycling of contaminated metals, initially lead, which is an identified waste processing priority.

Summary Purpose/Need:
By incorporating glovebox robotics, teleoperations, and advance material transfer techniques, a complete processing line can be completed that reduces the need for operators, thus increasing productivity and reducing risks. Our focus on recycling and reuse technologies will help us determine the feasibility of processing wastes to useful materials.

Summary Result/Endpoint/Deliverable:
This effort involves development of automated glovebox technologies for processing of radioactive, hazardous, and mixed wastes.

BDAT: NA

Functional Areas: robotics
front end handling
other
lead treatment/recycle

Target Site: Lawrence Livermore National Laboratory

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
LLNL MWMF, EM Cross-complex

ID: 65

Program Title: Whole Barrel Survey and Segregation

Summary Description:
LLNL has been working on a noninvasive method to characterize sealed waste drums. Computed tomography (CT) can determine radioisotopes and their activities in sealed containers. However, low throughput renders CT impractical for waste facilities. Limitations to practical CT use in characterizing waste drums can be overcome by improved CT scanners, data interpretation, and sensor fusion. Development on this project has reached the pilot-scale stage.

Summary Purpose/Need:
Waste barrels must be labeled, assayed, and certified. An accurate, nondestructive assay method would identify all the radioisotopes present and quantitatively measure their activities. In this way, waste containers could be routed in the most cost-effective manner without the drums having to be opened.

Summary Result/Endpoint/Deliverable:
This project will provide a CT system ready for technical transfer to commercial operators.

BDAT: NA

Functional Areas: characterization
characterization, monitoring & assay

Target Site: Lawrence Livermore National Laboratory

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
LLNL MWMF

ID: 69

Program Title: Immobilization of Wastes in Ceramics

Summary Description:
This project is at the conceptual stage for planning studies in the area of ceramic waste form development for mixed waste, low level waste, and transuranic waste. Waste forms based on naturally occurring mineral phases such as sodalite and close analogs of those minerals will be designed to accommodate each type of waste.

Summary Purpose/Need:
Ceramic waste forms can be designed to achieve very high waste loading with high durability of the waste forms.

Summary Result/Endpoint/Deliverable:
Research is scheduled to be completed by 1994, with bench scale feasibility projects begun in 1995.

BDAT: HLVIT STABL

Functional Areas: final form
final form ceramic

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
DP Programs
Facilities: Savannah River, Los Alamos, Rocky Flats, Hanford

ID: 74

Program Title: Electrochemical Ion Exchange

Summary Description:
This technology is used for the concentration of nitrate in ground water and the destruction of nitrate in ground water and various actinide recovery process streams.

Summary Purpose/Need:
1. Treat ground water surrounding nuclear facilities e.g. Hanford, Savannah River, for removal of excess nitrates.

2. Treat actinide recovery process streams to destroy excess nitrate.

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: chemical physical treatment

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 75

Program Title: Radiation-Based Mixed Waste Characterization.

Summary Description:
Integrated mixed waste analysis technology offers fast, low-cost field characterization of mixed waste. This system will characterize and screen radionuclides present in concentrations of 100 pCi/g to 100 nCi/g alpha. The presence of RCRA hazardous waste neutron absorbers in concentrations between 1 and 100 ppm can be established. The system consists of (1) a portable, compact gamma-ray detector and hand-held miniature multichannel analyzer; (2) a field-transportable, prompt gamma-ray analyzer with neutron activation source, passive neutron detector, high-resolution gamma-ray spectrometer, and miniature multichannel analyzer; and (3) computer-based data-acquisition and analysis system with multichannel input and control features. Bench-scale prototypes of components (1) and (2) have been completed. A pilot-scale component (3) system is now being used to monitor and characterize a waste tank. Mixed waste analysis awaits hardware adaptation, component integration, and software development.

Summary Purpose/Need:
Where applicable, this technology would replace costly and time-consuming sampling and analytical characterization. Radiation-based mixed waste measurements are fast, nonintrusive, and nondestructive., so waste handling is minimized. The measurement process generates no additional waste. Integrated data acquisition and analysis provide on-the-spot waste characterization and screening. These capabilities ensure correct waste categorization, thereby saving time and manpower in the field.

Summary Result/Endpoint/Deliverable:
This work will result in a prototype of an integrated radiation-based system for characterizing mixed waste ready for field test and evaluation.

BDAT: NA

Functional Areas: characterization

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Supports DP programs at TA-55/recovery and purification of plutonium for weapons related activities.

ID: 77

Program Title: Electrocatalytic Destruction of Organic Waste and Treatment of Mixed Hazardous Wastes

Summary Description:
The electrocatalytic destruction of organics is carried out at or near room temperature. Hence the only gaseous emissions are oxidation products such as carbon dioxide, water vapor, nitrogen oxides, etc. All radioactive elements remain dissolved in the aqueous electrolyte, available for subsequent recovery.

Summary Purpose/Need:
Electrocatalytic destruction is a viable alternative to incineration. There is no potential for radioactive gaseous emissions when destroying mixed hazardous wastes, and radioactive components are left in a form much more convenient for recovery or disposal.

Summary Result/Endpoint/Deliverable:
Results on bench-scale studies will be used to design a pilot-scale apparatus that will be tested on genuine mixed hazardous waste.

BDAT: CHOXD

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Majority of LANL operations.

ID: 79

Program Title: Controlled Air Incinerator

Summary Description:
[NONE LISTED]

Summary Purpose/Need:
The controlled air incinerator will make a major contribution to FFCA and LDR compliance. Approximately 30% of inventory and newly generated LLMW will be treated in this unit. It can eliminate the backlog of combustible liquid and solid LLMW in three years. The unit is sized to easily treat newly generated LLMW.

Summary Result/Endpoint/Deliverable:
We will produce a complete production-scale system, including secondary waste treatment capability.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
thermal treatment unit - high residue
primary organic destruction - high concentration

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Cross-complex

ID: 80

Program Title: Microwave Fluidized Bed Detoxification of Mixed Waste

Summary Description:
Microwave fluidized-bed detoxification which detoxifies vapor and liquid halohydrocarbon waste will be developed through R&D and pilot scale. The MFB technology may have direct applications in the Integrated Demonstration Projects at SR, SF or RL and RF sites for treatment of liquid or vapor halocarbon waste. Other applications may be at RFP in their fluidized-bed process and at LANL in treating TCE-A from soil. Transfer of the technology to the user will follow.

Summary Purpose/Need:
The proposed 2-year (FY93-94) effort is aimed at pilot-scale development of microwave fluidized-bed (MFB) technology capable of 99.99% destruction removal efficiency of halocarbon and other organic vapor or liquid waste. Detoxification occurs through oxidation of the halocarbon in a SiC fluidized bed reactor which is heated by microwaves to temperatures of less than 600 deg C. The process is highly energy efficient and should be cost effective due to its continuous nature. Another advantage of the technology over incineration, which is the baseline technology for treatment of halocarbons and other organic hazardous wastes, is elimination of the formation of products of incomplete combustion which can occur during incineration.

Other advantages of microwave heating are (1) it is rapid, uniform, and acts in situ; (2) the container vessel remains at room temperature while its contents are heated; and (3) chemical processes can be conducted at lower temperatures and pressures, reducing products of incomplete combustion.

Summary Result/Endpoint/Deliverable:
In FY92, 1,1,1 trichloroethane (TCE-A) detoxification to 92% in a single pass through a 0.915 GHz MFB reactor is demonstrated. In FY93 the engineering feasibility of 99.99% detoxification will be investigated. If 99.99% detoxification is practical, a pilot scale system for waste treatment will be designed, constructed and tested in FY94. We can expect an MFB system capable of throughputs between 0.5 and 5 kg/h. MFB technology may be directly applicable in the Integrated Demonstration Projects for treatment of liquid or vapor halocarbon waste.

BDAT: INCIN CHOXD

Functional Areas: waste destruction & stabilization
primary organic destruction - high concentration
alternative organic destruction - high concentration

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Done.

ID: 81

Program Title: Liquid Metal Recycle and Waste Treatment

Summary Description:
This is an analytical effort to evaluate the application of molten metal processing to mixed waste treatment.

Summary Purpose/Need:
This technology offers recovery of reusable metal (such as steel and stainless steel), reduced burial volume (slag only), and a stable actinide form (glass).

Summary Result/Endpoint/Deliverable:
We will produce an overview report, followed, if necessary, by process development.

BDAT: RMETL

Functional Areas: final form
material recycle
melt slag-ferrous metals

4695

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
EM Waste Management Program

ID: 85

Program Title: Decontamination and Recycling of Lead Bricks

Summary Description:
The technology used for treatment of surface-contaminated lead bricks and shields is macroencapsulation. However, the waste is still a mixed waste. Surface contamination can be removed using an abrasive slurry. The lead can then be recycled. The abrasive slurry with the radioactive lead can be solidified and is expected to pass TCLP. Even if it does not pass, there is a substantial waste volume reduction.

Summary Purpose/Need:
This technology permits recycling, removes less lead than high-pressure decontamination systems, and is fast and safe. It is also applicable to other solid surfaces, whether mixed or not.

Summary Result/Endpoint/Deliverable:
This project is already in the commercial state of development. The goal is the recycling of lead in storage.

BDAT: RLEAD STABL

Functional Areas: chemical physical treatment
decontamination
lead treatment/recycle

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
This activity is part of the 'Atlas' integrated Nitrate processing system within the LANL Plutonium Facility

ID: 86

Program Title: Nitric Acid Recycle

Summary Description:
Previously, waste nitric acid has been neutralized with caustic, then cemented for disposal. We seek to recycle nitric acid by evaporation and distillation. The bulk of the acid will be reused, and process waste will be greatly reduced. The radioactive and hazardous parts of the waste will be left behind in a smaller volume for disposal.

Summary Purpose/Need:
This process greatly reduces the volume of waste. There will be less waste for long-term storage, and a reduction in reagent usage, resulting in cost savings. The process is applicable to a wide variety of waste-acid streams and radioactive material processing within DOE.

Summary Result/Endpoint/Deliverable:
We will demonstrate an integrated prototype nitric acid recycling system.

BDAT: RCORR

Functional Areas: chemical physical treatment
evaporation
material recycle

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
MWIP
LANL sites

ID: 87

Program Title: Two-stage PBR/SDP for LLMW

Summary Description:
The existing LANL two-stage PBR/SDP waste treatment pre-pilot apparatus will be used to 1) evaluate two-stage PBR/SDP waste treatment technology for wastes of concern to the LANL FFCA, Rocky Flats and the DOE Complex (hazardous organics, nitrates), 2) determine the technology scaling parameters, , and 3) continue to work with industry in transferring the technology to the private sector. This program evaluates the suitability of removing organics (hydrocarbons and hazardous organics such as chlorocarbons) and nitrates from simulated wastes.

Summary Purpose/Need:
The benefits of the PBR/SDP are completeness of destruction, efficiency, simplicity, and reduced greenhouse gases. The technology may be more acceptable to the public and, therefore, more easily permitted. Industry participation in transferring this technology to the private sector as part of an initiative in Advanced Oxidation Systems for Waste Treatment will continue.

Summary Result/Endpoint/Deliverable:

Conceptual design for pilot facility for treatment of Rocky Flats cutting fluids and oils planned for incineration. The treatment of various organics will continue to be optimized, and prototype equipment will be developed at the LANL. The resulting technology will be transferred to private sectors. The technical review letter report and technology status report will be prepared for HQ-DOE review in FY93.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration
RCRA 2nd stage destruction
destroy gas phase organics

Target Site: Argonne National Laboratory East

Location site: Argonne National Laboratory East

Programs/Facilities Supported:
Argonne's Waste Management Operations, the process will be installed to handle existing ANL mixed wastes and serve as a pilot for treating organic mixed wastes at other DOE facilities.

ID: 88

Program Title: Unvented Thermal Process for Treatment of ANL Mixed Waste

Summary Description:
The current effort has as its goal the demonstration of a new concept for destroying organic materials in mixed wastes in a process that does not release gaseous products of combustion to the environment. Work is being proposed for funding by EM that would complete the development needed to install the appropriate equipment at ANL for handling the mixed wastes now on hand. After pilot-scale testing, the fluidized bed technology would be transferable to other DOE facilities with similar mixed waste streams.

Summary Purpose/Need:
The process appears to be inherently safe and reliable. Upset conditions do not cause release of unreacted organics. For these reasons, the process should be more easily licensed in heavily populated areas than standard incinerators. The process is being developed because it appears to be more reliable in avoiding release to the environment of unburned organic material than any other process we know of.

The proposed system can also be retrofitted to existing incinerators. The offgas is directed through the proposed system and then recirculated to the incinerator with oxygen addition. At ANL, the system will be used with direct injection of organic liquids into the fluidized bed. The system could also be used as a add-on to existing incinerators such as a rotary kiln to process the off-gas provided oxygen is used for burning. Under these circumstances, the spent lime would probably be calcined in a separate fluidized bed and then recycled to minimize solid waste byproducts. The system is capable of removing all acid gases including CO_2, SO_2, HBr and HCl.

Summary Result/Endpoint/Deliverable:
An existing 15-cm dia. fluidized-bed reactor which has been used for experiments on fluidized bed burning of coal is being converted for use in destroying organic waste materials. In this project, the appropriate reaction temperatures will be established for rapid reaction of CO_2 with lime. After bench scale efforts, the process will be installed to handle existing ANL mixed wastes. In later studies, organic materials containing chlorides, bromides and sulfides will be tested to determine the suitability of the process for other DOE sites such as LLNL, LANL, SRP, and RF.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
offgas technology

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
1. All programs using Pb loaded glovebox gloves
2. All DOE analytical labs.
3. If successful, a new concept for separations
4. WIPP and Hanford TWRS.

ID: 89

Program Title: 1. Replacement of Glovebox Gloves with Non-Hazardous Alternative
2. CLS-1 Waste Minimization/Mitigation Plan
3. Nuclear Reactor Fuel Reprocessing
4. Waste Characterization

Summary Description:
Leaded glovebox gloves have historically been used to provide glovebox workers with protection from exposure to x-rays. The purpose of the first project is to replace lead with suitable alternatives.
The goal of the second project is to develop a waste minimization/mitigation plan that will result in essentially zero mixed waste.
The third project will provide an on-line/at-line method for fuel reprocessing with inorganic precipitants.
The fourth project is the characterization of waste destined for WIPP, including Hanford waste tanks.

Summary Purpose/Need:
The first project replaces mixed waste with low-level radioactive waste. The second reduces analytical laboratory wastes, the third replaces the Purex process, and the fourth involves state-of-the-art chemistry.

Summary Result/Endpoint/Deliverable:
The goal of the first project is commercial application; the endpoint for the others is completed bench-scale study.

BDAT: NA

Functional Areas: other
waste minimization

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
- Advance Reactor Development Program
  - ANL-W Fuel Cycle Demonstration
  - Actinide Recycle Program

ID: 92

Program Title: Integral Fast Reactor Program, Pyroprocess Dev.

Summary Description:
Pyrochemical processes are being developed that will facilitate the recovery of TRU elements from LWR fuel, conversion of weapons components to a harmless form useful for ALMR fuel, and recycle of ALMR spent fuel to capitalize on the breeding potential of the fast reactor. Concurrently, high-level waste management processes are being developed for the IFR pyroprocessing system that will minimize waste volumes and produce superior high-level waste forms acceptable for geologic disposal.

Summary Purpose/Need:
The Advanced Liquid Metal Reactor is viewed as a solution to the future energy needs of the U.S., as an efficient device for the elimination of world stockpiles of plutonium, and as a means for burning the transuranic (TRU) elements present in spent LWR fuel. The supporting pyroprocess can handle virtually any feed material and provide for elimination of toxic radionuclides from high-level waste. The pyroprocess been successfully applied on a bench scale to Rocky Flats ash heels (Pu scrap). It is applicable to any Pu scrap stream and could be used to process virtually all of the spent fuel in storage at INEL, regardless of fuel type. It can be applied to navel reactor fuel and can also be used for processing of HTGR fuel, but in this latter case would require the addition of a head-end operation to burn off the graphite.
Key benefits from the processes being developed include:
- Elimination of actinides (U, Np, Pu, Am, Cm) from high-level waste.
- Minimized waste volumes: To 10-15% of volume of unreprocessed spent fuel, no secondary waste streams - maximized recycling of reagents.
- Cost benefit: Reduce capital cost for reprocessing and waste management facilities
  - Improved waste form: Inherently superior retention of long-lived radionuclides, elimination of actinides

Summary Result/Endpoint/Deliverable:
DOE-NE strategy calls for a pilot-scale demonstration of the IFR fuel cycle to be completed by 1997, processing almost 2 MT of spent EBR-II fuel. A similar demonstration of the recovery of actinides from spent LWR fuel will follow, to be completed around the year 2000. This will be followed by construction of a commercial prototype reactor and associated reprocessing plants, to begin operation in 2005. Commercial deployment of the technology will begin in 2010.

BDAT: HLVIT

Functional Areas: other
radionuclide removal

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
This project supports waste minimization efforts in P & S projects.

ID: 94

Program Title: Reuse, Recycling, and Decomposition of Calcium Chloride

Summary Description:
Plutonium pyrochemical processes at Los Alamos have traditionally been performed in specific salts for each process. This project concerns the use of calcium chloride in all of the processes and also involves the decomposition of the calcium chloride into chlorine and calcium for reuse.

Summary Purpose/Need:
This technology will minimize waste generated in pyrochemical operations and will limit the amount of downstream aqueous processing that is required. The current technology involves discarding low-concentration salts and the dissolution and recovery of high-plutonium-concentration salts.

Summary Result/Endpoint/Deliverable:
We will demonstrate the reuse of excess salt. After actinide removal, the salt will be decomposed, and the net result will be a total recycling and reuse of reagents. Finally, the process will be transferred to the pyrochemical production site.

BDAT: NA

Functional Areas: waste minimization
other

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
None

ID: 98

Program Title: Chemically Bonded Ceramic Waste Forms

Summary Description:
This project shows that chemically bonded ceramics (e.g. phosphate-bonded materials) are processing materials for use as waste forms in the disposal of wide variety of radioactive and mixed wastes. The concept of the project is to use phosphates to mineralize the heavy metals and radioactive constituents of the waste into insoluble phosphates and also to bind the mineralized material into a durable monolith.

Summary Purpose/Need:
We have demonstrated that both ALPO and magnesium ammonium phosphate based cements can be successfully solidified with excellent performance characteristics. This project involved production of test specimens with low porosity characterization such as porosity, strength, phase analysis, durability/leachability and radiation stability has been performed.
Wastes that cannot be handled by vitrification such as Hg Solutions, salt cakes, processing salts, pyrophorics and beryllium wastes, toxic metal containing materials are candidates for disposal using this final form.

This technology is unique for treating wastes which contain heavy metals and/or volatile species. This technology involves room or low temperature processing to develop a monolith. No off-gas treatment is required for it.

- lower cost (low temperature processing)
- improved waste form
- lowered personnel exposure
- no off-gas requirements
- Minimization of secondary waste streams.
- Some phosphates act as molecular sieves. This can be beneficial in having better leaching properties of radionuclides.

Summary Result/Endpoint/Deliverable:
This project is still in the R+D stage. The endpoint has yet to be determined.

BDAT: STABL HLVIT

Functional Areas: final form
final form ceramic
final form (mercury stabilization)

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
No specific facility.

ID: 102

Program Title: Chemical Detoxification

Summary Description:
This project aims to detoxify and convert to CO2, H2O, and HCL volatile organic chlorocarbons in air and in water. Useful for air emissions control in areas where chlorinated solvents are used. Also useful in treating VOCs in groundwater in a pump and treat operation.

Summary Purpose/Need:
Applicable to any VOC resulting from air-stripping operations or emitted from solvent cleaning operations. Complete destruction will be needed. Final output stream must meet EPA air quality standards. The project will result in technology capable of total destruction of compounds with no air pollution resulting.

Summary Result/Endpoint/Deliverable:
Completed bench studies.

BDAT: CHOXD

Functional Areas: waste destruction & stabilization
alternative organic destruction - low concentration
offgas technology

Target Site: Cross Complex

4695

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Tank waste WHC, U processing ORNL, Pu processing LANL, RFP, Soil NTS

ID: 104

Program Title: Magnetic separation

Summary Description:
Magnetic separation is a physical separation process that uses the slight magnetism of all actinide compounds to extract actinide-containing particles from inert materials. Magnetic separation is being developed for solid and liquid waste, and air born particulates.

Summary Purpose/Need:
In favorable circumstances, radioactive waste could be concentrated over six orders of magnitude. Magnetic separation also produces no additional waste in the remediation process.

Summary Result/Endpoint/Deliverable:
The endpoint schedule includes constructing a soil remediation prototype, with a tank waste prototype to follow.

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal
high efficiency separation

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
This supports the vault holdings reduction and plutonium recovery efforts at LANL.

ID: 105

Program Title: Oxygen sparge of spent pyrochemical salts.

Summary Description:
Oxygen sparging is currently used to recover small amounts of plutonium and americium left in salt stripping waste, a mixed waste generated from an old plutonium recovery process. This process also eliminates highly reactive sodium and potassium metals.

Summary Purpose/Need:
Although this process is only applicable to spent salts stored at Los Alamos and Rocky Flats, oxygen sparging has met WIPP criteria for the elimination of pyrophoric contaminants, and the final product is a non mixed waste.

Summary Result/Endpoint/Deliverable:
The process is being considered for inclusion in the REP project at Rocky Flats.

BDAT: RMETL DEACT

Functional Areas: chemical physical treatment
radionuclide removal
other

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
MWIP, MWTP, other OTD integrated demonstration and programs.

ID: 107

Program Title: Cost Savings Support to Mixed Waste Integrated Program

Summary Description:
This is a cost effectiveness study of the benefits of incorporating new waste remediation technologies in the mixed waste treatment project (MWTP) prototype plant. We are conducting a comparison of new subsystems (for example, the plasma arc furnace) with the MWTP baseline flow sheet to determine the relative cost and benefit of incorporating improved technology into the plant design.

Summary Purpose/Need:
This approach provides a standard technology-based evaluation and a life-cycle estimate of the cost to the environmental remediation project.

Summary Result/Endpoint/Deliverable:
While other technology evaluations are on-going, the plasma arc technology cost evaluation will be completed in June 1993.

BDAT: NA

Functional Areas: system analysis
decision support

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Nuclear Materials Program at LANL
-Complex - 21/reconfiguration
-Site Return Disassembly

ID: 108

Program Title: Automated Retirement and Integrated Extraction System (ARIES)

Summary Description:
The goal of this project is to devise an automated, mechanical and chemical system for the disassembly and recovery of retired nuclear weapon components. Uranium and plutonium solids will be separated from other weapon components without using standard solution processes.

Summary Purpose/Need:
This project will satisfy the following needs: 1) an 87% reduction in operator exposure, 2) a 99% reduction in aqueous secondary waste, and 3) a significant improvement in safety margins.

Summary Result/Endpoint/Deliverable:
Designs for the system should be complete September 1993, with prototype installation complete in 1994, and operation testing done by February 1995. We expect a "hot" start-up in April 1995.

BDAT: NLDBR

Functional Areas: waste minimization
other
robotics

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 109

Program Title: Biological Approaches to Actinide Decontamination and Recovery.

Summary Description:
The objective of this proposal is to develop biological binding agents, or chelators, for the selective removal of actinides from solid waste, such as soil, sludge, and organic residue. We have demonstrated that chelators and other analogs are effective in solubilizing actinides under mild conditions.

Summary Purpose/Need:
At present, methods used to solubilize actinide precipitates require harsh conditions. The use of biological chelators would enable decontamination and waste volume reduction with high efficiency.

Summary Result/Endpoint/Deliverable:
A study uranium decontamination of soils is in progress.

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
N/A

ID: 110

Program Title: Hydrocarbon Sensors

Summary Description:
This project proposes to develop real-time monitors for aqueous and gas phase wastes containing halogenated hydrocarbons. The goals are to develop species selective sensors for a monitoring system marketed by Motorola for use by industry and government.

Summary Purpose/Need:
The monitors developed in this project would permit field monitoring of the waste site at a sensitivity of 10 parts per billion for various chemical species.

Summary Result/Endpoint/Deliverable:
Important end points are as follows: 1) prepare and characterize monolayer films, March 1993; 2) develop a synthetic approach to multilayer sensor assemblies, August 1993; 3) summary report, September 1993; and 4) test facility upgrade for sensor operation, February 1994.

BDAT: NA

Functional Areas: characterization
monitoring
characterization, monitoring & assay

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
These activities support the Los Alamos Plutonium Facility and the Los Alamos Waste Treatment Facility and more generally the Rocky Flats Residue Elimination Program, Complex 21 activities, and EM waste treatment and environmental remediation programs.

ID: 111

Program Title: Extraction System for Removal of Radioactive and Hazardous Metal Ions From Aqueous Waste Streams.

Summary Description:
The general goal of these technologies is to selectively separate and concentrate radioactive and RCRA metal ions from aqueous waste streams. Alternative technologies are urgently needed to reduce the concentration of contaminating metal ions to extremely low levels, both to meet increasingly stringent regulatory limits and to decrease waste treatment and disposal costs. The approach involves the design, synthesis, and evaluation of extractant molecules with the required selectivity and binding constants to remove the target metal ions from the waste stream. The extractants can be used in a variety of liquid-liquid extraction systems or incorporated into polymers for use as solid sorbents or as water-soluble complexing agents.

Summary Purpose/Need:
These improved extraction technologies can provide a cost-effective replacement for sludge-intensive precipitation treatments and yield effluents that meet more stringent discharge requirements than precipitation methods. These technologies can also be much more selective and less energy-consuming than distillation. Of course, even among the various extraction systems under development there must be a competition to select the system with the best cost-benefit for the specific waste stream.

Summary Result/Endpoint/Deliverable:
The general endpoint of these activities will be an integrated prototype system that can be used in processing or waste treatment operations.

BDAT: RMETL

Functional Areas: chemical physical treatment
removal of problem constituents

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Defense materials programs, EM remediation programs

ID: 113

Program Title: Advanced Testing Line for Actinide Separations (ATLAS)

Summary Description:
ATLAS is a full scale demonstration facility which integrated the aqueous nitrate flow sheet with advanced analytical chemistry and process control techniques. The goal is to optimize the process which to a large extent means waste minimization and dealing with mixed waste streams.

Summary Purpose/Need:
There is no existing treatment/recovery technology for high-acid radioactive streams.
The goal is to develop a suitable technology to selectively recover the radioactive constituent from the waste stream. RCRA components of concern are all heavy metals which cannot be destroyed.

Summary Result/Endpoint/Deliverable:
An integrated pilot plant facility to demonstrate waste polishing techniques primarily on high-acid, low activity waste streams.

BDAT: RMETL

Functional Areas: chemical physical treatment
removal of problem constituents

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 115

Program Title: Biodegradation of Organics in Mixed Wastes

Summary Description:
The objective of this activity is development and demonstration of biodegradative approaches to treatment of organics in mixed wastes. Although the present emphasis is on destruction of contaminated cutting oils and nitrated rags (cellulose), organic wastes suitable for degradation are ubiquitous in the DOE complex.

Summary Purpose/Need:
Mixed radioactive/hazardous wastes pose a major problem for disposal and/or storage for the DOE complex because few publicly acceptable and proven alternatives exist for the disposal. Incineration, which is the BDAT for destruction of flammable liquids, faces exceptionally strong public opposition, in spite of its technical merits. There is a nationwide shortage of facilities that are permitted to treat mixed waste. Demonstration of a cost-effective treatment alternative that could be licensed, permitted and operated within a relatively short time would aid in solving a very pressing regulatory and permitting need. Cost savings of 90% over incineration costs are estimated.

Summary Result/Endpoint/Deliverable:
Contaminated oils - Cold tests at bench scale completed.
Contaminated rags - Cold test at bench scale completed.
Dependent on funding, development and demonstration would provide information to support pilot and prototype treatment units.

BDAT: BIODG INCIN

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
EM Waste Management Program

ID: 116

Program Title: Water-soluble, Chelating Polymers for Toxic Metal-Ion Separation

Summary Description:
We are developing chelating polymers that bind in homogeneous aqueous solution and use ultrafiltration as a means of removing toxic metal ions from variety of waste streams and materials (sludge or soils). This allows for ready recovery of both the metal-ions and the leaching or chelating agent without the use of organic solvents or resins.

Summary Purpose/Need:
There are a variety of advantages. First the separations are homogeneous and do not require the addition of organic solvent for toxic metal-ion separations. The kinetics are faster than with currently available ion exchange material and the chelating polymers are more specific than ion exchangers. Colloids which are a problem to ion-exchange techniques are eliminated with this approach.

Summary Result/Endpoint/Deliverable:
This work will have a many end points because of the large variety of applications that are anticipated. Currently, patent applications are in process. Simultaneously, there is R & D that is ongoing and bench scale operations are starting on some aspects of the work.

BDAT: RMETL

Functional Areas: chemical physical treatment
removal of problem constituents
radionuclide removal

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
Buried Waste Integrated Demo
VOCs in arid and non-arid soils IPS.

ID: 117

Program Title: Ultrasonic Detoxification of Groundwater and Soil

Summary Description:
TCE, CCl4 and other chlorinated hydrocarbons have been discarded in open pits at many DOE sites. The soil and groundwater is now contaminated with these compounds. Ultrasonic energy can be used to destroy these compounds.

Summary Purpose/Need:
Current technology is not suitable for groundwater and soils cleanup. This project supports the Buried Waste Integrated Demo and the VOCs in Arid and Non-arid Soils Integrated Programs.

Summary Result/Endpoint/Deliverable:
Field demonstration of an integrated process in FY94. This demo will involve an enhanced bench scale system.

BDAT: INCIN WETOX

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
Generic technology development for mixed waste, Hanford tanks

ID: 119

Program Title: Bio-catalytic Destruction of Nitrate and Nitrite

Summary Description:
The purpose of this task is to develop a technology for reduction of nitrate and nitrite to N2 and H2O. The reduction reaction will be carried out using purified reductase enzymes that are immobilized onto a solid support providing a very high specific surface area. The reducing equivalents are provided by a low voltage electrical current which transfers electrons from the cathode to enzymes via an electron transfer dye. The use of enzymes enables very large specific catalytic activity to be obtained without the need for additional chemical reagents or the production of secondary waste streams. An aqueous biphasic system is used to protect the enzymes from inactivation while simultaneously allowing the transfer of nitrite and nitrate from the waste stream to the catalytic chamber

Summary Purpose/Need:
Biocatalysis utilizing immobilized enzymes is the only technology that can destroy nitrate/nitrite without the addition of chemical reagents or the generation of secondary waste streams with highly variable compositions. This treatment technique has the potential for significantly reducing the costs of waste pretreatment and disposal.

Summary Result/Endpoint/Deliverable:
The endpoint of this work will completed bench studies and a pilot reactor.

BDAT: CHRED

Functional Areas: chemical physical treatment

Target Site: Cross Complex

4695

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Currently supporting AIRES at LANL. Can support Pu, U, Li, storage T, and HE facilities. Activity supports all DOE programs dealing with wastes, storage, materials, personnel and cost issues.

ID: 120

Program Title: System Analysis

Summary Description:
Computer simulation technology has been used to assess Pu, U, Li, and HE processes throughout the NWL. The simulation technology makes it possible to predict/assess waste generation impacts for the entire system (factory to integrated complex level) as specific process parameters evolve. The scope includes developing state-of-the-art simulation techniques to evaluate waste minimization technologies for Pu processing/recovery. The goal is to provide comprehensive, defensible, and high quality system-level results to the technologists and decision makers to support technology development and research decisions by DOE

Summary Purpose/Need:
Simply state, there are no other approaches to system-level assessments other than costly and risky "trial and error" hardware/flowsheet prototypes.

Summary Result/Endpoint/Deliverable:
This effort supports all phases of technology/system/ facility evaluation and design activities. Simulation technologies are designed to "follow" development activities from "birth to death."

BDAT: NA

Functional Areas: system analysis
decision support

4695

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 121

Program Title: Barriers and Post-Closure Monitoring

Summary Description:
Demonstration of containment and post-closure monitoring approaches at field-scale, including seasonal variations in drying and freezing, primary emphasis is on coupled immobilization of hazardous/mixed waste in passive, permeable barriers and enhancement of volatile organic biodegradation.

Summary Purpose/Need:
Site closure and post-closure monitoring are regulatory requirements under RCRA, CERCLA, SARA, and DOE order 5820.2A. It is anticipated that regulatory environment will become increasingly stringent and for public acceptance of many in situ remediation approaches, containment will be required for multi-component waste streams.

Summary Result/Endpoint/Deliverable:
Demonstration of containment and post-closure monitoring approaches.

BDAT: STABL BIODG

Functional Areas: containment
monitoring

Target Site: Lawrence Livermore National Laboratory

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
LLNL MWMF, and LLNL EPD characterization needs

ID: 122

Program Title: Multiple Sensor Integration for Material Segregation-2

Summary Description:
The program has been working on advanced sensing and classification algorithms that when integrated with robotics and automation can characterize, singulate and sort the contents of drums. Utilizing this information the contents can be autonomously dispatched to the appropriate processing line. Based on process material flowsheets this capability will be critical to handle the large number of barrels to be processed daily. For material classification, sensor information is acquired from a wide array of sensors (ferrous materials, optical profiles, radiation detectors, etc.) and then interpreted and integrated into the classification algorithms for singulation and sorting. In an unknown and often hostile environment operator intelligence will be required for certain decisions. Teleoperation technologies coupled with sensor information will aid the operator in his decisions. These Technologies autonomous/telemanipulation control (with integral collision avoidance). For example, advanced 2D and 3d remote viewing technologies coupled with automatic manipulator end-point tracking systems allow the operator to operate more efficiently.

Summary Purpose/Need:
Automation coupled with advanced sensors and data interpretation allows a safe practical method for segregating the various waste streams prior to processing steps. This sensor based system yields a wide range of information and feedback for autonomous grasping and sorting. The integration of these sensor technologies allow segregation of the various combustibles, metals, and radioactive materials.

Summary Result/Endpoint/Deliverable:
Completed bench studies.

BDAT: NA

Functional Areas: robotics
characterization
sorting

4695

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
DP Programs

ID: 123

Program Title: EXCEL

Summary Description:
Previous solvent extraction operations of LANL for hydrochloric acid streams utilized tributyl phosphate in a tetrachloroethylene diluent. Tetrachloroethylene is RCRA listed waste. The purpose of the work is to find a suitable alternate diluent to replace tetrachloroethylene. The diluent will ultimately be used for production scale activities. The objective is to eliminate the possible generation of a mixed waste.

Summary Purpose/Need:
The use of an alternate diluent such as dodecane to replace tetrachloroethylene will eliminate the possible generation of a mixed waste.

Summary Result/Endpoint/Deliverable:
The result will be a pilot scale operation utilizing solvent extraction for the recovery of plutonium from hydrochloric acid solutions.

BDAT: NA

Functional Areas: waste minimization
other

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
This activity will be part of the 'EXCEL' integrated chloride processing system within the LANL plutonium facility.

ID: 124

Program Title: Hydrochloric Acid Recycle

Summary Description:
Previously, waste hydrochloric acid has been neutralized with caustic, then cemented for disposal. We seek to recycle hydrochloric acid by evaporation and distillation. The bulk of the acid will be reused, and process waste will be greatly reduced. The radioactive and hazardous parts of the waste will be left behind in a smaller volume for disposal.

Summary Purpose/Need:
This process greatly reduces the volume of waste. There will be less waste for long-term storage, and a reduction in reagent usage, resulting in cost savings. The process is applicable to a wide variety of waste-acid streams and radioactive material processing within DOE.

Summary Result/Endpoint/Deliverable:
We will demonstrate an integrated prototype hydrochloric acid recycling system.

BDAT: NLDBR

Functional Areas: waste minimization
material recycle

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
DP activities and Complex 21 Reconfiguration

ID: 126

Program Title: Supercritical Fluid Carbon Dioxide to Replace Chlorocarbon Solvents for Cleaning Plutonium

Summary Description:
This project focuses on developing a recycle SCF CO2 method to replace the current trichloroethane-based process for removing hydrocarbons that cause corrosion of plutonium components in stockpile. Development of this technology requires that the compatibility of SCF CO2 with Pu be verified, that analytical procedures for measuring hydrocarbon residues be developed, that parameters for optimal cleaning be identified, that specifications for a pilot (full-scale) SCF system be defined, that a pilot system be procured and installed, that parameters for production applications be defined, that CO2 recycle be demonstrated, and that equipment and procedures for safe glovebox operation in a Pu facility be established. The potential use of CO2 for degreasing Pu lathe turnings will also be investigated.

Summary Purpose/Need:
The current process for cleaning plutonium hemishells uses trichloroethane and a vapor degreaser. This process generates large volumes of mixed waste. Using SCF CO2 as the cleaning solvent instead of trichloroethane eliminates the addition of the solvent to the mixed waste volume. This same technology may be used to extract RCRA hazardous components from solid surfaces.

Summary Result/Endpoint/Deliverable:
The endpoint of this activity to demonstrate the process on a pilot system; optimize operating parameters for full-scale use; and prepare specifications or operating procedures for a full-scale system for cleaning plutonium components in production.

BDAT: NA

Functional Areas: waste minimization
removal of problem constituents

177

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
EM-50 Robotics Integrated Program

ID: 127

Program Title: Robotic NDA & Analytical Sample Characterization

Summary Description:
Characterization of input and output to a plutonium processing facility using automation and robotics.

Summary Purpose/Need:
Increased sample throughout, less exposure to radiation, more precise and accurate sample analysis.

Summary Result/Endpoint/Deliverable:
Currently a fully integrated prototype system.

BDAT: NA

Functional Areas: characterization
other
robotics

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Tank waste WHC, TRWS-TA program, and Air Force large rocket motor disposal program.

ID: 128

Program Title: Hydrothermal processing

Summary Description:
The purpose of the program is to evaluate the feasibility of hydrothermal processing for aqueous waste streams at DOE and DoD sites as well as other waste streams. Technology destroys organics, cyanides, nitrates, and nitrates. Wastes can contain alpha, beta, and gamma emitters.

Summary Purpose/Need:
As compared to incineration or calcining, gaseous effluent require little off-gas treatment. For nitrogen containing waste in Nox produced may be cheaper than incineration/calcining for aqueous waste with <20% organic material. Preliminary studies indicate cost savings over incineration/calcining because of reduced off-gas treatment, reduced energy consumption and reduced size. Process not very sensitive to waste stream composition. Explosives that are now open burned or incinerated could be disposed by hydrothermal processing. Organic liquids that are currently incinerated could be treated. Nitrates/nitrites can be converted to N2.

Summary Result/Endpoint/Deliverable:
The scope of the activity rages from bench scale R&D to pilot scale demonstration, depending on the particular program. LANL is building a pilot scale unit to treat high level Hanford tank wastes. Pilot scale (6 ton/day) facility will treat radioactive Hanford tank waste simulants (LANL). Pilot scale facility will dispose of 1.1 rocket propellant. Full-scale facility will treat oil industry waste.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
thermal treatment unit - high residue
alternative organic destruction - high concentration

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 130

Program Title: Surfactant Systems for Actinide Extraction/Encapsulation

Summary Description:
In this task, microemulsion-based solvent extraction systems will be developed for use in the treatment of actinide-containing liquid waste streams. These advanced extraction systems are composed of water-in-oil microemulsions that contain the bifunctional extractant CMPO. During the extraction process, hydrated metal ions are transferred from the aqueous feed to the aqueous core of the reversed micelles located in the organic phase. This solvent extraction system has recently been shown to be capable of extracting hydrolyzed metal species, including plutonium polymer. Back extraction is achieved by a novel technique that involves the encapsulation of the extracted metal species within nanometer-scale silica particles. The silica capsules are produced by a sol-gel technique that utilizes the aqueous microdroplets of the organic phase as a type of microscale chemical reactor. The leach resistant capsules can easily be harvested from the micro emulsion by a pH-dependent agglomeration process. Once harvested, the silica particles can be chemically treated to produce an ultra-dense, ceramic-based waste form that is extremely leach resistant.

Summary Purpose/Need:
This project is generic technology development for mixed waste. Advantages of this technology are:
1. High partition coefficients, 1000-10,000 for polymeric Pu
2. Can remove particles down to 40 nm range and extract at neutral to slightly acidic pH
3. Rad extracted is surrounded by silica microsphere so waste form can be produced easily.

Summary Result/Endpoint/Deliverable:
The end-point is completed bench studies. The end-point is an integrated demo at Fernald in FY 94, pilot facility with 500 kg batches of treated contaminated soil.

BDAT: RMETL LLEXT

Functional Areas: chemical physical treatment
radionuclide removal
removal of problem constituents

Target Site: Rocky Flats

Location site: Rocky Flats

Programs/Facilities Supported:
RFP LDR Compliance Program, RFP IAG

ID: 132

Program Title: Cement Solidification (Solar Pond Cleanout)

Summary Description:
The Cement Solidification Program is being developed to process waste liquids and sludges from the closure of operating unit 4 (OU4), the solar ponds. The immediate focus of the program is to eliminate the solar ponds as a source of contamination as a soon as possible. This will include solidification of wastes. All wastes remediated from the OU4 will be stored and disposed of in accordance with all regulatory and disposal site acceptance criteria.

Summary Purpose/Need:
The program is required to ensure that the final waste forms will meet Land Disposal Restrictions as well as all waste acceptance criteria. Compared to previous work done on the waste, this method will have a slight volume reduction, and therefore lower storage, transportation and disposal costs. This program is included in the critical path for milestones to complete the OU4 remedial action.

Summary Result/Endpoint/Deliverable:
The effort involves documentation, equipment specification, site preparation, and system procurement and evaluation to support deployment of a full scale waste handling and treatment system.

BDAT: STABL

Functional Areas: final form
final form-grout or macro-encapsulation

Target Site: Rocky Flats

Location site: Rocky Flats

Programs/Facilities Supported:
RFP LDR Compliance Program

ID: 134

Program Title: Thermal Treatment Process Unit/Fluidized Bed

Summary Description:
The overall objective of the project is to develop a Fluidized Bed Unit (FBU). Combustion of mixed waste is planned to operate at a low temperature (525-600 degrees C). The first stage of the FBU contains oxidation catalyst (chromia-alumina) and sodium carbonate to neutralize any acid off-gases. The second stage contains only oxidation catalyst. By neutralizing acid gases in-situ in the first stage, no off-gas scrubber is required. This eliminates a known source of a large volume of secondary waste. The low temperatures in the primary and secondary reactors eliminate the need for a refractory lining, thereby eliminating a secondary waste stream as generated from replacement of the lining. Ash generated during system operation will be treated by microwave solidification, polymer solidification, and/or cementation.

Summary Purpose/Need:
The overall goal of this activity is to provide a thermal treatment system which will be capable of treating many of the RFP mixed wastes. The wastes will be treated to meet RCRA, LDR, transportation and waste disposal site waste acceptance criteria.

Summary Result/Endpoint/Deliverable:
- Complete bench scale work on feeder and primary reactor - 9/93
- Develop engineering scope documents for design of production-scale FBU - 8/95
- Data sufficient to allow comparison with other candidate technologies and down-select of the preferred technology.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
thermal treatment unit - high residue

4695

Target Site: Rocky Flats

Location site: Rocky Flats

Programs/Facilities Supported:
RFP LDR Compliance Program

ID: 135

Program Title: Microwave Solidification

Summary Description:
Microwave solidification is being developed to address treatment of precipitation sludge (bypass sludge) from the aqueous liquid waste treatment facility in Building 374. Current treatment of this waste stream is accomplished by cementation which is not an optimum treatment technology and results in waste volume increases. Through microwave melting, waste volume is reduced by approximately 5 to 10 times over present solidification procedures. Glass and synthetic minerals offer a leach resistant, stable matrix well suited for hazardous wastes. The high treatment temperatures also ensure destruction of soluble materials such as nitrates. Several other waste streams at RFP have been identified as potentially amenable to microwave solidification. The RFP streams include incinerator ash, slags and crucibles.

Summary Purpose/Need:
The goal of this activity is to develop a process capable of producing a final waste form that meets the Land Disposal Restriction treatment standards, applicable transportation requirements, and disposal site waste acceptance criteria.

Summary Result/Endpoint/Deliverable:
- Complete demonstration-scale tests and data evaluation - 1/96
- Develop system and facility design to complete remaining regulatory compliance requirements - 11/96
- Data sufficient to allow comparison with other candidate technologies and down-select of the preferred technology.

BDAT: HLVIT STABL

Functional Areas: final form
final form glass
waste destruction & stabilization

Target Site: Rocky Flats

Location site: Rocky Flats

Programs/Facilities Supported:
RFP LDR Compliance Program

ID: 136

Program Title: Cement Solidification of Sludge, Salts and Ash (CTMP Compliance)

Summary Description:
Cement Solidification includes evaluation of current processes, development of new processes, identification of optimum formulas, and establishing operating envelopes. The saltcrete process in Building 374 is being studied now. In the future, improving solidification of the bypass sludge in Building 374, and solidification of FBU ash, FBU oil, particulate sludge, solidified organics, cutoff sludge, and low-level debris will be evaluated for cementation.

Summary Purpose/Need:
The goal of this study is to develop cementation processes that will produce durable waste forms that meet all applicable RCRA, LDR, transportation, and disposal site waste acceptance criteria.

Summary Result/Endpoint/Deliverable:
- Report summarizing results of formulation studies - 9/93
- Data sufficient to allow comparison with other candidate technologies and down-select of the preferred technology.

BDAT: STABL

Functional Areas: final form
final form-grout or macro-encapsulation

Target Site: Rocky Flats

Location site: Rocky Flats

Programs/Facilities Supported:
RFP LDR Compliance Program

ID: 137

Program Title: Catalytic Chemical Oxidation

Summary Description:
The Catalytic Chemical Oxidation (CCO) process is one part of the Rocky Flats Plant Incineration Alternatives (IA) project. IA is investigating individual technologies for the destruction of mixed combustible waste to allow selection of the most promising incineration alternative technologies for cold pilot scale system demonstration. This activity uses DOE laboratories and commercial firms to evaluate possible technologies. FY93 activities are focused on the largest volume categories of combustible waste: cutting oils and solid combustibles. The laboratory or subcontractor will define the optimum operating parameters and rates of destruction for each combustible waste stream which apply to CCO. The laboratory or subcontractor will provide a formal report detailing the results of the experimental work, including a basic conceptual design for a cold demonstration of CCO. The conceptual design will include material/energy balances, and identification of secondary waste streams and their treatment requirements. CCO is a low temperature/pressure treatment process which utilizes a catalyst (such as iron) in the presence of an acid bath to oxidize wastes.

Summary Purpose/Need:
The goals of this activity are to identify, develop, test and demonstrate chemical oxidation process alternatives to incineration for the treatment of RFP low-level mixed combustible waste, and for waste stream treatment across the complex. This activity is intended to meet the requirements of the Comprehensive Treatment and Management Plan (CTMP).

Summary Result/Endpoint/Deliverable:
- FY 93 development summary report - 9/93
-Data sufficient to allow comparison with other candidate technologies and down-select of the preferred technology.

BDAT: CHOXD INCIN

Functional Areas: waste destruction & stabilization
primary organic destruction - high concentration

Target Site: Rocky Flats

Location site: Rocky Flats

Programs/Facilities Supported:
RFP LDR Compliance Program

ID: 138

Program Title: Surface Organic Contaminant Removal

Summary Description:
Many of Rocky Flats Mixed wastes are hazardous as a result of contamination with low levels of RCRA-listed solvents. Treatment technologies to remove organic contaminants from Land Disposal Restricted (LDR) waste forms to meet LDR may also allow disposal of some wastes as non-hazardous. This activity investigates several organic removal technologies including Supercritical Carbon Dioxide Extraction (SCDE), Volatilization/Cleaning, Hot Nitrogen Stripping (HNS), and other volatilization technologies such as radio frequency (RF) heating, steam cleaning and air stripping.

Summary Purpose/Need:
The goals of this activity are to evaluate SCDE and commercially available removal technologies, determine their feasibility and applicability to treat LDR wastes for organic contaminants, and select appropriate surface cleaning technology for RFP mixed wastes. Treated wastes may then be disposed of in compliance with RCRA, transportation requirements, and disposal site waste acceptance criteria.

Summary Result/Endpoint/Deliverable:
- SCDE Experimental Test Plan - 6/93
- Technology Status Report on HNS - 5/93
- Technology Status Report on selected volatilization technologies - 9/93
- Data sufficient to allow comparison with other candidate technologies and down-select of the preferred technology.

BDAT: RORGS LLEXT

Functional Areas: chemical physical treatment
removal of problem constituents

4695

Target Site: Cross Complex

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
UST ID

ID: 142

Program Title: UST: Excavation and Retrieval UST Wastes By Water Jets (Confined Sluicing)

Summary Description:
Design and fabricate a shrouded high-pressure water jet end effector. Perform four series of tests to examine waste removal, water recovery, damage to tank walls, and vertical slurry transport. Document testing results, and compare with LLNL, WHC and PNL efforts. Recommend a preferred retrieval approach.

Summary Purpose/Need:
Development efforts are needed to design and fabricate a shrouded high-pressure water jet end effector determine methods to adequately excavate and retrieve UST Wastes.

Summary Result/Endpoint/Deliverable:
Deliverables include test plan, results, and prototype high-pressure water jet end effector to Hanford testbed.

BDAT: NA

Functional Areas: retrieval

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 143

Program Title: UST: Wastes Dislodging Technology Development

Summary Description:
Identify, select, develop, and test candidate hard waste dislodging concepts in a continuation of FY92 activities. For FY93, develop, fabricate, test (against simulated Hanford tank waste) and demonstrate a rubble-forming equipment concept as part of the waste dislodging system at Hanford. Modify FY92 equipment for CO2 use.

Summary Purpose/Need:
Development efforts are needed to design and fabricate rubble-forming equipment to adequately dislodge excavate and retrieve UST Wastes.

Summary Result/Endpoint/Deliverable:
Deliverables include FY93 project plan and prototype hardware to Hanford testbed.

BDAT: NA

Functional Areas: retrieval
size reduction

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 144

Program Title: UST: Early Deployment System (EDS) - Robotic Characterization of UST

Summary Description:
Develop and deploy a remote characterization system that includes: 1) the remote insertion of a sensor package that can assay waste tank gas contents, 2) perform non-intrusive mapping of the waste using laser-range finding, and 3) conducting a topological survey of the waste surface using structured lighting. Data retrieved during characterization will be interpreted and graphically displayed in real time to the operator and end user as well as stored in a database for later utilization.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a prototype remote characterization system.

Summary Result/Endpoint/Deliverable:
Deliverables include FY93 project plan and prototype hardware to Hanford testbed.

BDAT: NA

Functional Areas: characterization

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 145

Program Title: UST: Light Duty Utility Arm

Summary Description:
Develop and demonstrate a positioning system for performing characterization, surveillance, and scaled retrieval testing operations in a variety of USTs. Complete procurement efforts by placing the contract for a light duty utility arm. Within funding constraints, begin preparation of the Light Duty Arm testbed, so that cold testing can begin upon receipt of the arm. Design and construct a test platform compatible with simultaneous testing with the Long Reach Arm.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a prototype positioning system.

Summary Result/Endpoint/Deliverable:
Deliverables include conceptual design report, and a prototype positioning system

BDAT: NA

Functional Areas: characterization
robotics

Target Site: Hanford

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 146

Program Title: UST: Integrated Instrument Platform for In-Situ Characterization of Tank Wastes [new title pending]

Summary Description:
Provide systems integration support to characterization instrumentation development activities and deployment technology activities to ensure fully functional and compliant in-tank characterization systems. Provide methods and equipment to support the safe and efficient demonstration and qualification of candidate waste tank characterization instruments and deployment technologies developed by others. Provide the infrastructure and essential monitoring, control, and power functions; define interfaces between instruments and deployment systems.

Summary Purpose/Need:
The task shall ensure the following: 1) open communication between the characterization and retrieval functions; 2) definition of and compliance with interface requirements; 3) definition of and compliance with power requirements; 4) data acquisition and storage; 5) identification and satisfaction of deployment, regulatory and safety issues; 6) sample control and transfer; and 7) site logistics. Near term efforts shall include integration of an instrument platform with the light-duty utility arm.

Summary Result/Endpoint/Deliverable:
Deliverables include revised project plan, design report, and test plan for platform system demonstration tests.

BDAT: NA

Functional Areas: characterization
system analysis

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 147

Program Title: UST: Waste Dislodging and Conveyance Technology

Summary Description:
Complete testing of the soft waste test unit constructed in FY92. Coordinate testing objectives and simulant requirements with the task "Hydraulics requirements in support of dislodging and conveyance systems development." Coordinate testing operations with the PNL effort "Multifunction scarifier/conveyer" to maximize the use of common equipment and test fixtures. Acquire a developmental air conveyance unit to support testing in this task and related PNL, SNL (University of Missouri-Rolla), and LLNL testing efforts. Issue (draft) specification for prototype soft waste end effector. Document testing results, and compare with LLNL, SNL and PNL efforts. Recommend retrieval approach. Define, describe, and specify conveyance concept for in tank hardware. Develop concept for end effector cleaning; test as appropriate using shared CO2 equipment acquired within other UST-ID retrieval activities.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a prototype soft waste end effector.

Summary Result/Endpoint/Deliverable:
Deliverables include draft specification for soft waste end effector and test report.

BDAT: NA

Functional Areas: retrieval

695

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 148

Program Title: UST: Light Duty Utility Arm Sampling End-Effector

Summary Description:
Develop, fabricate and demonstrate a remote sampler, deployable by the light duty arm, for sampling of hard and soft wastes within Hanford SSTs. The sampler shall be capable of sampling salt cake, slurry, and supernate at any given location or depth within a tank and shall preserve sample stratification on stiffer samples. The sampler shall be compatible with the light duty utility arm, from which the sample may be decontaminated and removed from the tank.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a prototype remote sampler.

Summary Result/Endpoint/Deliverable:
Deliverables include project plan and test plan, draft conceptual design report, and FY93 test report.

BDAT: NA

Functional Areas: characterization

Target Site: Hanford

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 149

Program Title: UST: Simulants for Retrieval Tasks

Summary Description:
This project provides for the preparation of simulated tank wastes needed by the testing efforts covered by dislodging and conveyance system testing under the UST-ID Waste Retrieval Project. Investigate simulants applicable to the end-effector task for demonstration testing and evaluation and provide a report documenting requirements.

Summary Purpose/Need:
Simulated tank wastes are needed by the testing efforts.

Summary Result/Endpoint/Deliverable:
Deliverables include report documenting simulants.

BDAT: NA

Functional Areas: retrieval

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 150

Program Title: UST: Multi-Functional Scarifier/Conveyer: Design and Development of a Multifunction Scarifier End Effector with an Integral Conveyance System

Summary Description:
Develop a hydraulic end effector that minimizes water accumulation during retrieval of salt cake, sludge and viscous liquids from Hanford single shell tanks. The technology to be developed is a scarifier with an integral conveyance system that simultaneously erodes and conveys waste out of the tank.

Summary Purpose/Need:
The integral conveyance system will minimize accumulation of working fluid during operation. Rapid development and demonstration of a water based prototype will provide a unit to meet retrieval demonstration requirements.

Summary Result/Endpoint/Deliverable:
Deliverables include draft and final reports, and prototype scarifier/conveyer end effector.

BDAT: NA

Functional Areas: retrieval

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 151

Program Title: UST: Hydraulics Technology: Hydraulics Technology in Support of Tank Waste Dislodging and Conveyance Systems Development

Summary Description:
Define and guide dislodging and conveyance systems development testing for both salt cake and sludge ("hard" and "soft") waste types. Include defining system requirements with respect to the hydraulic transport components, establishing data objectives for testing, and defining acceptance requirements for each dislodging/conveyance system.

Summary Purpose/Need:
Development of the hydraulics systems requirements under this task and technical coordination with the related "long-reach manipulator" and "end effector" efforts will ensure that viable designs and specifications for dislodging and conveyance equipment can be communicated to a commercial vendor for procurement. Special emphasis will be placed on showing traceability of design requirements to specific EM-30 needs.

Summary Result/Endpoint/Deliverable:
The principal product of this coordinating task will be documentation of FY93 testing results, comparison of LLNL, PNL, SNL and WHC efforts, and recommendation of retrieval approach.

BDAT: NA

Functional Areas: retrieval

4695

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 152

Program Title: UST: Long Reach Arm-Kinematics

Summary Description:
Support the UST-ID WHC retrieval lead to develop and demonstrate a "cold prototype" long-reach arm in support of Hanford tank waste retrieval. Specific tasks include preparing, teamed with ORNL, the dynamic and kinematic analyses that will guide selection of vendor concepts and, with WHC lead, in systems evaluation efforts involving modeling and component selection.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a prototype remote sampler.

Summary Result/Endpoint/Deliverable:
Deliverables include project plan, Long Reach Manipulator procurement specification, and prototpye test equipment to Hanford.

BDAT: NA

Functional Areas: retrieval
robotics

197

Target Site: Cross Complex

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
UST ID

ID: 153

Program Title: UST: Long Reach Arm - Control System

Summary Description:
Support the UST-ID WHC retrieval lead to develop and demonstrate a "cold prototype" long reach arm in support of Hanford tank waste retrieval. Specific tasks include bringing ORNL expertise in advanced dynamic and kinematic analyses and human-machine interface to bear on the Long-Reach Manipulator design activity.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a prototype long reach arm.

Summary Result/Endpoint/Deliverable:
Deliverables include project plan, Issue Long Reach Manipulator procurement specification, and prototpye test equipment to Hanford.

BDAT: NA

Functional Areas: retrieval
robotics

4695

Target Site: Cross Complex

Location site: Savannah River

Programs/Facilities Supported:
UST ID

ID: 154

Program Title: UST: Baseline Technologies for UST Remediation

Summary Description:
Document, relate, and report applicable SRS retrieval technologies relevant to Hanford UST retrieval needs. Technically contribute to key reviews; advise of existing technologies and facilitate technology transfer to Hanford where appropriate. Advise and direct Hanford in-tank viewing efforts, based on experience at SRS. Attend and participate in UST-ID program reviews, Technical support group and TWRS technical working group activities.

Summary Purpose/Need:
Applicable SRS retrieval experience and technologies relevant to Hanford UST retrieval needs should incorporated.

Summary Result/Endpoint/Deliverable:
Deliverables include final report.

BDAT: NA

Functional Areas: retrieval

199

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 155

Program Title: UST: Long Reach Arm - Systems Coordination and Definition

Summary Description:
Coordinate the multilaboratory effort to develop and demonstrate a "cold prototype" long reach arm in support of Hanford tank waste retrieval. Initiate procurement efforts for a Long Reach Arm test unit. Define the development and testing process that will lead to generation of specifications and requirements for the EM-30 production retrieval arm to be used in the Hanford tanks. Coordinate this task with the National Robotics - Integrated Program. Perform systems evaluations for the Long Reach Arm.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a prototype long reach arm.

Summary Result/Endpoint/Deliverable:
Deliverables include project plan, Long Reach Manipulator procurement specification, and prototype test equipment delivered to Hanford.

BDAT: NA

Functional Areas: retrieval
robotics

46

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 156

Program Title: UST: Light Duty Utility Arm - Laser Range Finder

Summary Description:
Support the UST-ID WHC retrieval lead to develop and demonstrate a positioning system for performing characterization, surveillance, and scaled retrieval testing operations in a variety of USTs. Specific tasks include analyses of proposed vendor configurations using kinematic and dynamic modeling techniques, direction of tank and waste mapping end effector development, and participation, with WHC, in the design, construction, and testing of a sampling end effector.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a positioning system.

Summary Result/Endpoint/Deliverable:
Deliverables include design review, conceptual design reports, and prototype.

BDAT: NA

Functional Areas: retrieval
characterization
robotics

201

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
UST ID

ID: 157

Program Title: UST: Long Reach Arm - Maintenance and Decontamination

Summary Description:
Support the UST-ID WHC retrieval lead to develop and demonstrate a "cold prototype" long reach arm in support of Hanford tank waste retrieval. Specific tasks include transferring and applying INEL expertise learned in tank applications, including fielding of the Remote Tank Inspection manipulator ("Red-Zone Arm"), in the fields of remote maintenance and decontamination of complex servomechanical devices.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a prototype long reach arm.

Summary Result/Endpoint/Deliverable:
Deliverables include project plan, Long Reach Manipulator procurement plan, and prototype test equipment delivered to Hanford.

BDAT: NA

Functional Areas: retrieval
robotics

4695

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
UST ID

ID: 158

Program Title: UST: Light Duty Arm - Technical Interface

Summary Description:
Support the UST-ID WHC retrieval lead to develop and demonstrate a positioning system for performing characterization, surveillance, and scaled retrieval testing operations in a variety of USTs. Specific tasks include transferring and applying INEL expertise learned in tank applications, including fielding of the Remote Tank Inspection (RTI) manipulator, to light duty arm applications.

In this role, INEL acts as technical lead in evaluating technical progress by the manipulator vendor. Also, in-tank viewing technology acquired in the application of the RTI will be transferred to this application.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a positioning system.

Summary Result/Endpoint/Deliverable:
Deliverables include conceptual design, design review reports and prototype.

BDAT: NA

Functional Areas: retrieval
characterization
robotics

203

Target Site: Cross Complex

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
UST ID

ID: 159

Program Title: UST: Light Duty Utility Arm - Computer Interface/End Effector

Summary Description:
Support the UST-ID WHC retrieval lead to develop and demonstrate a positioning system for performing characterization, surveillance, and scaled retrieval testing operations in a variety of USTs. Specific tasks include interfacing SNL Generic Intelligent System Controller work, established under the Robotics IP, and transferring and applying the technology to the Light Duty Arm.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a positioning system.

Summary Result/Endpoint/Deliverable:
Deliverables include conceptual design, design review reports, and prototype.

BDAT: NA

Functional Areas: retrieval
characterization

4695

Target Site: Cross Complex

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
UST ID

ID: 160

Program Title: UST: Long Reach Arm - Computer Interface

Summary Description:
Support the UST-ID WHC retrieval lead to develop and demonstrate a "cold prototype" long-reach arm in support of Hanford tank waste retrieval. Specific tasks include interfacing SNL Generic Intelligent System Controller work, established under the Robotics IP, and transferring and applying the technology to the Long-Reach Manipulator.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a long reach arm.

Summary Result/Endpoint/Deliverable:
Deliverables include conceptual design, design review reports, and prototype.

BDAT: NA

Functional Areas: retrieval
robotics

205

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 161

Program Title: UST: Waste Retrieval Project Coordination

Summary Description:
Continue implementation of the UST-ID management structure that coordinates the DOE guidance for the Technology Demonstration Program. Develop and utilize appropriate support groups to assist and provide technical guidance for the UST. Identify and implement governing regulatory requirements for the applicable sites and enhance communication networks between the DOE sites and regulatory bodies. Continue development and enhancement of baseline documentation.

Summary Purpose/Need:
The UST-ID management structure that coordinates the DOE guidance for the Technology Demonstration Program is required.

Summary Result/Endpoint/Deliverable:
Deliverables include Program Management Plan (Revised), Program Master Schedule, Configuration Management Plan, Problem Statements Document, and Final BDAT Document.

BDAT: NA

Functional Areas: other

4695

Target Site: Cross Complex

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
UST ID

ID: 162

Program Title: UST: Waste Dislodging

Summary Description:
Continue efforts in the evaluation and application of shears, abrasive water jet cutting, and small commercial tools for the removal of in-tank hardware. Broaden the perspective of the task to include other approaches to hardware removal, such as internally cutting larger diameter pipes by using specialized (non-robotic) tools.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop waste dislodging tools and approaches.

Summary Result/Endpoint/Deliverable:
Deliverables include final report.

BDAT: NA

Functional Areas: retrieval

Target Site: Cross Complex

Location site:

Programs/Facilities Supported:
Potential cross-complex

ID: 164

Program Title: DIAL - The Diagnostic Instrumentation and Analysis Laboratory

Summary Description:
The specific program objectives will be to utilize optical diagnostics in three areas of hazardous waste reduction: (1) plasma torch waste reduction, (2) supercritical water reactors, and (3) real-time hazardous waste combustion control. In each case, the diagnostics will be used to determine control and operational parameters for optimum performance both thermally and environmentally.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
1. Evaluation report of characterize operating parameters of plasma torch.
2. Evaluation report of the performance of the plasma torch process.
3. Laboratory scale prototype supercritical water reactor.
4. Laboratory scale combustor.
5. Evaluation report of the performance of operating combustor.

BDAT: NA

Functional Areas: characterization
process control

4695

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
MWIP

ID: 167

Program Title: Waste Form and Vitrification Process Development for Mixed Waste

Summary Description:
Vitrification has been applied to high-level radioactive waste but has not been demonstrated as cost-effective for mixed low-level radioactive waste. SRTC and university subcontractors will develop glass/ceramic waste forms and demonstrate processes using commercially available melters.

Demonstration of superior performance, life-cycle costs and risk over cementation will provide data and justification for a "best demonstrated technology" for mixed waste treatment. Collaboration among different sites (PNL, LANL, RFP) and institutions (D/IC at Clemson University, N.Y State College of Ceramics, the University of Missouri-Rolla, and the Virginia Military Institute). The effort consists of two primary objectives: 1) Glass Waste Form Development; and 2) Vitrification Process Development. Test cases will consist of sludges representative of Rocky Flats, LANL, and ORNL sludges and an ash representative of Rocky Flats, LANL, ORNL or SRS ashes. Work will also be conducted on drummed solids wastes.

Summary Purpose/Need:
Current Joule-heated HLW melters are capable of producing high quality LLMW or TRU waste forms, but are expensive. They have limited capabilities for repair, and their design life is two years. Stirred melter technology is being rapidly developed and is believed to offer significant improvements in equipment cost, repair, recovery from operating upsets, replacement time, and final melter disposal. TECO Inc. (a well-known commercial glass furnace design firm) has established a subsidiary to manufacture and market high temperature melters for waste vitrification.

LLMW can be delisted for hazardous materials by vitrification, simplifying and reducing the life-cycle costs and allowing direct land disposal in appropriate LLW facilities. Both the stirred and high temperature melters offer unique advantages to vitrifying mixed wastes.

Summary Result/Endpoint/Deliverable:
Key technical requirements to establish vitrification technology as viable for low-level mixed waste will be established focusing on a delisting petition. Deliverables include technical requirements, data quality objectives for vitrification technology, a preliminary flowsheet for mixed waste vitrification, and a strategy for delisting mixed wastes.

BDAT: HLVIT STABL

Functional Areas: final form
final form glass
final form ceramic

209

Target Site: Cross Complex

Location site: Savannah River

Programs/Facilities Supported:
UST ID

ID: 168

Program Title: UST: Cs Extraction Testing

Summary Description:
The UST at Hanford plans to utilize ion exchange for removal of cesium and strontium from high level liquid supernate using the SRS resorcinol-formaldehyde resin. SRWS will provide technical data on ion exchange chemistry and radiation chemistry to support design and operation of a "Compact Process" for cesium removal. Oak Ridge will provide similar support for a strontium ion exchange process. Included in this task is the investigation of commercially available and foreign technology for Cs removal.

Summary Purpose/Need:
The SRS resin can hold 10 times as much cesium as the CS-100 resin which Hanford currently plans to use. This extra capacity will allow a reduction in process equipment size. The superlative cesium loading and selectivity of the SRS resin and its strong chemical integrity may offer significant economic and technical benefits for other sites in the DOE Complex. Data generated will benefit SRS needs as well; SRS may consider ion exchange as a potential backup or second generation process for In Tank Precipitation.

Summary Result/Endpoint/Deliverable:
Deliverables include 1) Project/Test Plan/Mid-Year Status Report 2) Technical Report on Cs Extraction from Hanford Tank Waste Streams and 3) Technology Profile for ProTech Info System.

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal
ion exchange

4695

Target Site: Cross Complex

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
UST ID

ID: 172

Program Title: UST:SF211203 Raman Spectroscopy system

Summary Description:
Procure and integrate a complete Raman Spectroscopy system for use in tank waste analysis. Provide a probe for use with optical fibers to examine the Raman response of solids and sludges through a radiation resistant window. This system will be delivered to Hanford for testing and analysis.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop Raman Spectroscopy system.

Summary Result/Endpoint/Deliverable:
Deliverables include 1) system specifications to WHC, 2) hot cell Raman system and probe to WHC, and 3) Technology Profile for ProTech Info System

BDAT: NA

Functional Areas: characterization
characterization
characterization, monitoring & assay

211

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 173

Program Title: Storage Tanks-West: Long Reach Manipulator (LRM) System

Summary Description:
Develop a prototype LRM for waste retrieval and in situ characterization of UST waste. Activities include:

Implement CRADAs
LRM prototype specified and order placed
Develop advanced high level LRM control system
Demonstrate/prepare specs of multiple sensor systems
Demonstrate robotics UST retrieval technology

Future planned work: Receive Long Reach Manipulator, integrate lab-developed systems with LRM and demonstrate integrated system. Integrate LRM System with EM-30 Retrieval System.

Storage Tanks-West: Light Duty Utility Arm (LDU)

Develop manipulator controls, end effectors, sensors and User Interface to UST-ID-lead Light Duty Utility Arm System. Activities include:

Integrate MiniLab with UST-ID funded Characterization Platform
Specify requirements for improved dynamic control of LDU
Demonstrate Minilab chemical & radiation sensors
Demonstrate Minilab viewing/mapping systems
Future planned work: Integrate lab-developed equipment with Light Duty Utility Arm and provide cold demonstration of integrated system.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Develop a prototype LRM for waste retrieval and in situ characterization of UST waste. Develop manipulator controls, end effectors, sensors, and User Interface to UST-ID lead Light Duty Utility Arm System.

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support the USTID.

BDAT: NA

Functional Areas: retrieval
characterization
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
UST ID

ID: 174

Program Title: Storage Tanks - East: Silo Waste Retrieval System (WRS) and Cost/Benefit Analysis

Summary Description:
ST-East will also enhance an existing in-field testbed for the Robotics Technology Development Program (RTDP) and Underground Storage Tank Integrated Demonstration (UST-ID) projects to support time-critical remediation measures at multiple sites.

Silo Waste Retrieval System (WRS) -- Integrate and demonstrate all major subsystems for a robotics device to dislodge a surrogate waste material and transport to a central location. Activities include:

Finish development of image-based tracking system
Finish detailed design of device and end effectors
Finish procurement and fabrication of WRS
Finish WRS soft/hardware integration with GISC
Demonstrate WRS

Future planned work: Develop special end effectors for heel and residual waste removal.

Cost/Benefit Analysis -- Generate a cost/benefit analysis of appropriateness of the FEMP Silo 4 as the robotics storage tanks test bed. Activities include:
Collect site assessment, cost, needs, and benefit data
Write cost/benefit analysis

Future planned work: Based on the conclusion of cost/benefit analysis, develop Silo 4 as a test bed to support both ST-East and ST-West demonstrations.

Note: The plan is that the RTDP Storage Tanks-East Program efforts will be joint funded through the OTD Robotics Integrated Program (EM-50), the Underground Storage Tanks Integrated Demonstration (EM-50), and the FEMP Environmental Restoration Program (EM-40). Other major thrusts include 1) the design, fabrication, testing, and demonstration of waste conveyance and packaging hardware to interface with the FEMP Silo WRS, and 2) the development of a second-generation surface mapping system tailored to Hanford EM-30 tank characterization needs.

Summary Purpose/Need:
The program is to develop a satisfactory baseline. Integrate and demonstrate all major subsystems for a robotics device to dislodge a surrogate waste material and transport to a central location.

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support the USTID, and generation of

a cost/benefit analysis of appropriateness of the FEMP Silo 4 as the robotics storage tanks test bed.

BDAT: NA

Functional Areas: retrieval
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 175

Program Title: Remote Characterization System (RCS)

Summary Description:
Complete development, fabrication, integration, and demonstration of all components for mobile robotics systems to characterize buried waste. Develop and demonstrate dig face characterization technologies. Activities include:

Finish development and testing of Low Signature Vehicle (LSV)
Integrate and test magnetometer
Finish development/integration of RCS components
Demonstrate RCS at INEL
Demonstrate RCS at FEMP
Demonstrate dig face characterization

Future development efforts will focus on enhanced/new technologies for remote characterization.

Summary Purpose/Need:
The program is to develop a satisfactory baseline, including development, fabrication, integration, and demonstration of all components for mobile robotics systems to characterize buried waste. Develop and demonstrate dig face characterization technologies.

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support the BWID. Technologies demonstrated will be transferred to industry through BWID.

BDAT: NA

Functional Areas: characterization
retrieval
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 176

Program Title: Remote Excavation System (RES)

Summary Description:
Integrate, test, and demonstrate end effectors and navigation control systems on the Small Emplacement Excavator (SEE) vehicle. Develop and demonstrate remote excavation capability for selective retrieval. Activities include:

- Finish enhancements/modifications of RES components
- Perform integrated systems test of RES
- Demonstrate RES at INEL
- Demonstrate RES at FEMP
- Develop remote excavation capabilities
- Design Machine Health Monitoring System

Future development activities focus on new remote excavation techniques.

Summary Purpose/Need:
The program is to develop a satisfactory baseline, including integration, test, and demonstration of end effectors and navigation control systems on the Small Emplacement Excavator (SEE) vehicle. Develop and demonstrate remote excavation capability for hot spot retrieval.

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support the BWID. Technologies demonstrated will be transferred to industry.

BDAT: NA

Functional Areas: retrieval
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 177

Program Title: Remote Size Reduction (RSR)

Summary Description:

Transfer remote plasma arc cutting technology to industry. Enhance the accuracy of the RSR controller and demonstrate the added capability using alternate cutting technologies. Activities include:

Upgrade control system for precision RSR and selective retrieval
Demonstrate/Transfer RSR plasma technology to commercial sector
Demonstrate added RSR technologies

Future development will be focused on alternate cutting technologies such as zero waste generation methods.

Summary Purpose/Need:
The program is to transfer remote plasma arc cutting technology to industry, and develop a satisfactory baseline, including enhanced accuracy for the RSR controller and demonstration of added capability using alternate cutting technologies.

Summary Result/Endpoint/Deliverable:
The effort involves transfer of remote plasma arc cutting technology to industry and documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support the BWID.

BDAT: NA

Functional Areas: waste destruction & stabilization
waste destruction & stabilization
process control

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 178

Program Title: Contaminant Analysis Automation

Summary Description:
The Contaminant Analysis Automation (CAA) team develops fully automated modules which perform a generic task common to compounds from solid waste. The modules are chosen for their repeated use as parts of several standard Environmental Protection Agency (EPA) approved analysis protocols. Certain EPA protocols were targeted because they were widely used in DOE analysis laboratories and represent a significant fraction of sample loads. Another criterion for module/protocol targeting is reduction of laboratory worker exposure. Underlying themes for designing of hard/software are transportability, architectural openness, and modularity.

Summary Purpose/Need:
The program is to develop systems to automate analytical chemistry procedures so as to process the immense number of samples necessary for DOE's environmental restoration and waste management efforts. Current DOE capacity to analyze samples is saturated, causing unacceptably long sample turn-around times and direction of projects with less than the required number of analyses. These and other problems will become worse as sampling requirements increase with the sharp "ramping up" of projects. The CAA group is developing modular systems to automatically perform a single, standard step (e.g., filtration, concentration, extraction) which can be set up in assembly line fashion. Since all modules use the same communications/control scheme, they can "plug and play" to perform multiple analytical chemistry methods.

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: characterization
analytical laboratories
robotics

4695

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 179

Program Title: Testing and Modification of Standard Laboratory Modules (SLMs)/Standard Support Modules (SSMs)

Summary Description:
- In preparation for validation, test actual lab operation of SLMs/SSMs for EPA Methods 3540 and 3550, modify hardware/software as necessary, retest, and document results. Activities include:

Finish modifications of Sonication, Soxhlet, Drying, GPC, Concentration, Filter, and Transfer SLMs/SSMs before laboratory testing.
Finish laboratory testing of above
Finish hardware modification of above based on lab testing

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support environmental restoration and waste management efforts. This activity is planned to be completed in FY93.

BDAT: NA

Functional Areas: characterization
analytical laboratories
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 180

Program Title: Demonstration of remaining SLMs/SSMs for EPA 3540 & 3550

Summary Description:
- Design, procure hardware, and fabricate SLMs and SSMs necessary to complete Standard Preparation Module (SPM) for frequently used EPA 3500 series methods and provide cost/benefit analysis. Activities include:

Finish Filtering SLM and Transfer SSM
- Finish EPA Methods 3540/3550 cost benefit analysis
- Finish Concentration SLM
- Finish Glassware/Thimble, Column/Filter, and Sample Introduction SSMs.
- Finish SPM Barcoding System
- Finish liquid/liquid extraction SLM

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support environmental restoration and waste management efforts. This activity is planned to be completed in FY93.

BDAT: NA

Functional Areas: characterization
analytical laboratories
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 181

Program Title: EPA Validation of prototype individual SLMs

Summary Description:
Coordinate the work-plan and scheduling, create the sample analysis plans based on DOE Methods Performance Rating Scheme, validate, interpret results, document, and report. Activities include:

Finish validation of Sonication and Soxhlet SLMs
Finish validation of GPC SLM and Transfer SSM
Finish validation of Concentration, Drying, and Filtration SLMs/SSMs
Direct support for testing laboratory.

Future planned work: Integrate validated SLMs/SSMs into the EPA 3540/3550 Standard Preparation Method (SPM) and finish validation of SPM as a system. Initiate EPA validation for Data Interpretation Method for EPA 8080 (PCBs).

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support environmental restoration and waste management efforts.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 182

Program Title: SLM Software Design

Summary Description:
Coding and testing of Standard Control software, Data Interpretation software, user interface, and database. Activities include:

Finish prototype SAM Script processing Software
Finish internal control code for Concentration and Filtration SLMs
Demonstrate prototypical SAM user interface and database
Finish documentation of control software
Finish internal control code for Glassware/Thimble, Column/Filter, Transfer, digestion and Sample SSMs/SLMs
Finish prototype of PCB Data Interpretation Module for routine samples
CAALS collaboration

Future planned work: Continue refinement of user interface and database. Develop defensible and auditable electronic notebook within database. Develop intelligent sample analysis feedback from DIM to SAM controller for on-line process modification.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support environmental restoration and waste management efforts.

BDAT: NA

Functional Areas: robotics
process control
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 183

Program Title: SLM Design for EPA Method Series 3000 SPM

Summary Description:
Development of the acid digestion method SLMs. Activities include:

Finish Hanford Lab survey and purchase IAETL (International Association of Testing Labs) survey
Finish division of EPA 3000 series methods
Finish conceptual design and construction prototypical SLMs

Future planned work: Continue refinement of EPA Method 3000 series SLMs fabricated in FY93. Finish design and construction of additional SLMs necessary for demonstration of the first digestion SPM.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support environmental restoration and waste management efforts.

BDAT: NA

Functional Areas: characterization
analytical laboratories
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 184

Program Title: Remote Inspection and Survey of Stored Waste Drums

Summary Description:
Fabricate, integrate, and demonstrate a mobile robot system to autonomously collect/store images of stored waste drums, maintain extensive database of information, and produce a radiation survey map of the aisles.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: storage
characterization, monitoring & assay
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 185

Program Title: Drum Opening, Emptying, and Transportation Systems

Summary Description:
Procure, install, and test equipment for remote opening of drums and emptying of contents. Determine best equipment for remote transportation of drums in waste facilities. Activities include:

Design drum lifting equipment
Order drum opening/emptying/lifting equipment
Place membership in Materials Handling Research Center
Install drum opening/emptying and conveying equipment
Begin testing drum opening/emptying equipment
Install singulation manipulator and drum dumper
Develop auto modeling system for singulation from drum

Planned future work:
Finish testing of drum opening/emptying equipment and finish report, place appropriate projects with MHRC.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: front end handling
receiving
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 186

Program Title: AC Swing-Free Crane Control

Summary Description:
Develop, demonstrate, test, and evaluate swing-free crane control on an AC crane of specified pendulum length. Develop and test sensor-based swing-free crane control. Activities include:

Order AC drives and sensors
Install AC drives and sensors
Demonstrate swing-free AC crane control
Test and evaluate bench scale sensor based control

Planned future work: Transfer AC swing-free crane control to industry, demonstrate sensor-based swing-free control.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: front end handling
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 187

Program Title: Item Characterization and Sorting

Summary Description:
Demonstrate, test, and evaluate automated radiographic and metallurgical characterization and automated sorting of typical solid waste in waste drums. Demonstrate, test, and evaluate radiographic survey of material inside drums before opening.
Activities include: Demonstrate fully automated characterization/sort
Demonstrate small scale drum internal survey ; Install characterization and conveying system at SRTC

Future planned work: Further develop automated system and integrate system into WFO test bed.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: characterization
sorting
robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 188

Program Title: Telerobot Improvements

Summary Description:
Finish graphical programming of Telerobot for operator ease to include selecting tools and paths directly by selecting from the 3-D simulation without using menus. Move automatic standoff control to low-cost, robot-controller compatible system for technology transfer. Install system to automatically update the model of the workcell. Activities include:

Order IBM-AT compatible laser
Demonstrate "point and click" (tools, paths, etc.) programming
Demonstrate IBM-AT compatible standoff control
Install auto workcell model update system

Future planned work: Transfer technology to industry.

Summary Purpose/Need:
The program is to develop a satisfactory baseline, with a focus on automating various waste activities at fixed facilities, with the goal of increased efficiency and safer working conditions. Additionally, planned development includes a mobile robot to comply with regulatory requirements of periodic inspection of stored waste drums, and a waste container processing testbed.

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support environmental restoration and waste management efforts.

BDAT: NA

Functional Areas: robotics
front end handling
storage

4695

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 189

Program Title: Waste Processing Operations-Liaison to National Mixed Waste Programs

Summary Description:
Provide liaison to EM-50 and EM-30 mixed waste programs to assist in developing detailed systems analyses, conceptual designs, and implementation plans for coordinated RTDP and national waste treatment efforts. WPO will identify Fiscal Year (FY) 94 activities supporting Mixed Waste Integrated Program (MWIP), Mixed Waste Treatment Program (MWTP), and other waste treatment programs as a result of this effort.

Summary Purpose/Need:
The Waste Processing Operations (WPO) team concentrates on developing automation technologies for processing high level waste materials following item separation. These technologies will be integrated to demonstrate waste and residue processing applications.

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: robotics
system analysis
decision support

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 190

Program Title: Waste Process Stream Handling System

Summary Description:
Develop and demonstrate process stream automation technologies. This includes characterization, handling, item sorting, and processing technologies for specific treatment processes targeted in the MWTP baseline plan. Activities include:

Demonstrate waste item dimensional characterization
Demonstrate waste item singulation from feed streams
Demonstrate surface cleaning and scarifying techniques
Demonstrate processing integrated system

Future planned work: Expand capability for feedstock preparation and sorting including complex heterogeneous waste streams

Summary Purpose/Need:
The program is to develop a satisfactory baseline, with a focus on automating various waste processing activities, with the goal of increased efficiency and safer working conditions.

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support environmental restoration and waste management efforts.

BDAT: NA

Functional Areas: robotics
sorting
decontamination

4695

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 191

Program Title: Decontamination & Decommissioning

Summary Description:
The Decontamination and Decommissioning effort is in the advanced planning stage. Emphasis in this area will be increase in the upcoming fiscal years. Scheduled for D&D are many facilities which are radiation and/or hazardous material contaminated from high level, such as hot cells, to low level, such as entire buildings. The focus is on automating the facility D&D process to maximize efficiency while minimizing human exposure.

Description

Major thrusts include:

- Asbestos Removal and Bagging System
- Telerobotic Decontamination and Dismantlement Systems
- Mobile Floor Characterization System
- Mobile Decontamination and Dismantlement Systems with Dual Arm Manipulators
- Fernald Automated Decontamination Plant

Summary Purpose/Need:
D&D is planned for many facilities which are radiation and/or hazardous material contaminated from high level, such as hot cells, to low level, such as entire buildings. This program focuses on automating the facility D&D process to maximize efficiency while minimizing human exposure.

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support environmental restoration and waste management efforts.

BDAT: NA

Functional Areas: robotics
decontamination

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 192

Program Title: Sensing Systems

Summary Description:
Develop and integrate sensor packages for control of robot manipulators and vehicles as well as integrated robotics and sensory arrays for characterization, in-situ, of hazardous waste sites. Automated generation of contaminant maps to guide remediation efforts is a product of this activity. Activities include:

- Complete testing of chemically selective coating for silicon capillaries
- CAT scan of 55 gallon drum using Ge radiation sensor
- Fabricate and demonstrate modular MiniLab
- Advanced GPR system controller and data sampler operational
- Demonstrate whole arm collision avoidance system using actual robot
- Chemical flow microsensor testing

Future planned work: Fieldable MiniLab Modules available and CRADAs for MiniLab fully in place. Advanced GPR system completed. Whole arm sensing technology available for general use.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: characterization
robotics

4695

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 193

Program Title: Controls

Summary Description:
Develop algorithms for control of robotic systems (arms and vehicles) as well as the Generic Intelligent System Controller (GISC) for general use within RTDP projects. Activities include:

Initiate training classes in GISC
Final Version of GISC Version 2.0 documentation
Finish development and provide Version 2.0 GISC to RTDP Team
Demonstrate flexure control of commercial manipulator

Future planned work: Libraries of reusable GISC software in general use within RTDP. Industrial suppliers of GISC software modules. Automated programming modules available in GISC.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: robotics
process control

233

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 194

Program Title: Systems Analysis

Summary Description:
Develop a generalized approach to cost/benefit analyses for application to all RTDP projects. Integrate individual RTDP cost/benefit analyses into a general RTDP cost/benefit analysis evaluating RTDP as a whole.

First draft C/B analysis of major RTDP robotics projects
Generalized C/B analysis tool to RTDP Team
Generalized analysis of major RTDP robotics projects finished

Future planned work: RTDP strategic plan based upon cost/benefit analysis. Cost/Benefit based technology development selection criteria established.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: robotics
system analysis
decision support

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 195

Program Title: Mechanisms

Summary Description:
Develop generic mechanical systems of broad RTDP usage. Initially concentrated on Modular Robotics by designing/integrating modular mechanical and control subsystems of a flexible and extensive manipulator. Develop specifications, design, procure, fabricate, and integrate modular mechanical and control subsystems to prove feasibility. Activities include:

Design hydraulic joint module/link interface
Conduct workshop on Modular Robotics
Procure hydraulic joint module/link
Finish top-down scoping study/develop specifications

Future planned work: Finish repeatability and reliability performance testing on hydraulic joint/link interface. Design and perform critical element tests. Design, procure, and fabricate 2 DOF electronic joint module. Design, procure, adapt and integrate control system for reconfigurable arm.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: robotics
system analysis

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 196

Program Title: University R&D Program

Summary Description:
Sponsor university R&D programs to initiate longer term focused R&D in advanced technology areas such as software safety and system reliability, manipulator control, advanced operator interfaces, advanced sensor interpretation, and environmental hardening. Activities include:

Review of Phase I and II Contracts
Third Phase Univ. Contracts In Place

Planned future work: Twenty (20) University R&D contracts fully funded. Joint University/Lab program for graduate students' thesis work in place.

Summary Purpose/Need:
Technologies that are commonly used by all robotics application areas are developed by this team. For example, software control of complex robotics systems, a common need, cannot be adequately done by commercially available high-level control packages. Additionally this program focuses on high leverage advanced projects (3-5 year timeframe).

Summary Result/Endpoint/Deliverable:
The effort involves documentation, testing, equipment specification, pilot system procurement and fabrication of prototype systems to support the RTDP environmental restoration and waste management efforts.

BDAT: NA

Functional Areas: robotics

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 197

Program Title: Noninvasive Site Characterization, Phase 2: Program Plan for Assessing and Integrating Space, Airborne and Surface Methods

Summary Description:
During FY-1992, a strong team has been developed that can perform the important integration role for DOE/OTD in the area of remote sensing and noninvasive geophysics. This team includes the intelligence, remote sensing, environmental restoration, and geophysics groups at Los Alamos National Laboratory with support from Environmental Research Institute of Michigan) (ERIM), Stanford University and USGS/Flagstaff. This integration team will form an interagency working group to plan and monitor a coordinated program of demonstrations at several DOE sites as funds become available.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
Deliverables include 1) Technology status report 2) Workshops to facilitate integrations 3) Coordination of site demonstrations with other TD projects.

BDAT: NA

Functional Areas: characterization

Target Site: Sandia National Laboratories (Albq)

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
MWL ID

ID: 198

Program Title: Los Alamos Program for Barriers and Post Closure Monitoring

Summary Description:
Demonstration, testing and evaluation of water-permeable chemically reactive barriers, in-situ biodegradation, and post-closure monitoring technology in integrated environmental containment systems is the purpose of this program. Barrier and post-closure monitoring tests will be conducted at field-scale demonstration plots and actual contaminated sites.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
Deliverables include:

1. Supporting laboratory test report, industry reservoir management application report, 3 additional testbeds, and a preliminary and final report on application
2. PROTECH Technology Information Form

BDAT: BIODG STABL

Functional Areas: containment
monitoring

Target Site: Sandia National Laboratories (Albq)

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
MWL ID

ID: 199

Program Title: Migration Barrier Covers for Mixed Waste

Summary Description:
The scope of the project is to design a migration barrier cover system for a mixed waste landfill from the results of an existing migration barrier field demonstration. FY93 tasks will include forming a TSG and monitoring an ongoing demonstration at Hill Air Force Base in Utah to provide hydrologic performance data. This information will be used to develop optimum cover barrier designs for the mixed waste landfill demonstration at Sandia in FY94.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
Deliverables include barrier design report, report on design and alternatives to TPO, and Pro-Tech profile information form.

BDAT: NA

Functional Areas: containment

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 200

Program Title: Waste Destruction and Stabilization Technology Specification

Summary Description:
The Waste Destruction/Stabilization TSG is responsible for development of technologies to treat concentrated organic waste streams and heterogeneous and homogeneous solid waste streams. Technical activities currently monitored by this TSG are: plasma arc furnace, molten metal technologies, and control of metal emissions. EM-30 is depending on the MWIP TSGs to provide technology development expertise and guidance to the newly established engineering development teams for the EM-wide mixed waste program.

In this task Performance Specifications for Waste destruction / Stabilization Technology Demonstrations that meet Waste Treatment Needs will be determined. The findings will also contribute to testing of Chemical/Physical Treatment technologies and to testing of Off-Gas Treatment

Summary Purpose/Need:
The Mixed Waste Integrated Program (MWIP) Technical Specification Groups (TSGs) are responsible for technology development systems planning for the National Mixed Waste Program. This project reflects a new structure for the TSG. The organization has been streamlined to enhance accountability and authority of the TSG leader. This should ensure that only necessary activities are acted on and productive participants are adequately funded.

There are five TSGs linked and aligned with the Office of Waste Management (OWN) EM-30 modular treatment concept; Front-end Waste Handling, Chemical/Physical Treatment, Waste Destruction and Stabilization, Off-gas Treatment and Final Waste Forms. TSGs also provide the major mechanism for technical coordination between MWIP and EM-30 and other mixed-waste related EM-50 activities.

Summary Result/Endpoint/Deliverable:
Deliverables include a Technical Area Status Reports (TASRs) - Assessment of the current state of technology and associated gaps in knowledge requiring RDDT&E.

BDAT: INCIN RMETL

Functional Areas: waste destruction & stabilization
system analysis
decision support

4695

Target Site: Rocky Flats

Location site: LANL

Programs/Facilities Supported:
RFP LDR Compliance Program

ID: 201

Program Title: Packed-Bed Reactor/Silent Discharge Plasma (PBR/SDP)

Summary Description:
The PBR/SDP process is part of the Incineration Alternatives (IA) project. IA is investigating individual technologies for the destruction of mixed combustible waste to allow selection of the most promising incineration alternative technologies for cold pilot scale system demonstration. This activity uses DOE laboratories and commercial firms to evaluate possible technologies. FY93 activities are focused on the largest volume categories of combustible waste: cutting oils and solid combustibles. The laboratory or subcontractor will define the optimum operating parameters and rates of destruction for each combustible waste stream which apply to PBR/SDP. The laboratory or subcontractor will provide a formal report detailing the results of the experimental work, including a basic conceptual design for a cold demonstration of PBR/SDP. The conceptual design will include material/energy balances, and identification of secondary waste streams and their treatment requirements.

Summary Purpose/Need:
The goals of this activity are to identify, develop, test and demonstrate the PBR/SDP process as an alternative to incineration for the treatment of RFP low-level mixed combustible waste, and for waste stream treatment across the complex. This activity is intended to meet the requirements of the Comprehensive Treatment and Management Plan (CTMP).

Summary Result/Endpoint/Deliverable:
- FY 93 development summary report - 9/93
- Data sufficient to allow comparison with other candidate technologies and down-select of the preferred technology.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
primary organic destruction - high concentration
RCRA 2nd stage destruction

241

Target Site: Rocky Flats

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
RFP LDR Compliance Program

ID: 202

Program Title: Real-Time Emission Monitoring

Summary Description:
The objective of this task is to develop a method to monitor incinerator off-gases in real-time for the presence of alpha-emitting radionuclides in a continuous manner for the planned RFP Thermal Treatment Process Unit. The on-line alarming detector will be integrated with a conventional sampling detector to provide a complete alpha-emitting radionuclide monitoring system, ready for field testing. This monitoring capability should include both the ability to provide spectroscopic radionuclide identification, as well as a fast response, high-sensitivity alarm.

Summary Purpose/Need:
The overall goal of this activity is to develop real-time emission monitoring for a new thermal treatment system. Although a variety of sampling detectors are available for radionuclide identification, no detection system exists for fast alarming with high sensitivity.

Summary Result/Endpoint/Deliverable:
- Build and test second generation prototype - 5/93
- Test system, establish FOM - 9/93
- Submit interim report on completion of tests - 9/93
- Procure commercial sampling detector - 1/94
- Design and build full scale prototype - 1/94
- Build field test facility - 6/94
- Field demonstration of complete system - 9/94

BDAT: INCIN

Functional Areas: off-gas technology
continuous emission monitoring
atmospheric discharge monitoring

4695

Target Site: Sandia National Laboratories (Albq)

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
MWL ID

ID: 203

Program Title: A Prototype Decision Support System to Select MWL Barrier Cover Systems

Summary Description:
Develop a multi-objective decision making software system using a Knowledge Based system, with embedded simulation models. This will be a tool to design engineered surface barriers for mixed-waste landfills. Utilize data collected from the Migration Barrier Covers for Mixed-Waste Landfills (TTP AL-1212-11) project to provide parameters for the models. Use the output of the decision support system to design an integrated barrier cover demonstration for the MWLID.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
Deliverables include report on model to TPO and on alternative selected to TPO.

BDAT: NA

Functional Areas: containment
system analysis
decision support

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
EM Mixed Waste Management Program

ID: 204

Program Title: Electron-Beam Waste Treatment Test Bed

Summary Description:
The existing LANL electron-beam waste treatment test bed is used to 1) evaluate electron-beam treatment technology for wastes of concern to the LANL FFCA and the DOE Complex (hazardous organics, nitrates), 2) determine the technology scaling parameters, design, procure, and 3) test a small-scale, high-average power pilot plant, and 4) continue to work with industry in transferring the technology to the private sector. This program evaluates the suitability of removing organics (hydrocarbons and hazardous organics such as chlorocarbons) and nitrates from simulated wastes.

Summary Purpose/Need:
The non-thermal technology may be more acceptable to the public and, therefore, more easily permitted. Industry participation in transferring this technology to the private sector as part of an initiative in Advanced Oxidation Systems for Waste Treatment will continue.

Summary Result/Endpoint/Deliverable:
The e-beam treatment of various organics will continue to be optimized, and high-average dose prototype equipment will be developed at the LANL. The resulting technology will be transferred to private sectors. The technical review letter report and technology status report will be prepared for HQ-DOE review in FY93.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
primary organic destruction - high concentration

4695

Target Site: Sandia National Laboratories (Albq)

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
MWL ID

ID: 207

Program Title: Geochemical Controls on Chromium Mobility

Summary Description:
Investigate the behavior of chromium waste under chemical conditions typical of the unsaturated zone. Perform a series of laboratory column experiments using well-characterized, experimental and naturally occurring materials as the matrix and simulated Cr-acid solutions. Identify and evaluate the long-term stability of precipitated oxide or hydroxide Cr phases. Incorporate the solution chemistry into an appropriate model for fluid infiltration using site-specific, hydraulic properties.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
Deliverables include status report on lab batch experiments, soil sample analysis, and model simulation to TPO. Prepare Pro-tech information profile.

BDAT: STABL

Functional Areas: containment
system analysis

Target Site: Sandia National Laboratories (Albq)

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
MWL ID

ID: 210

Program Title: Remedial Options Evaluation

Summary Description:
This project will identify and evaluate innovative remedial technologies that should be pursued by the Mixed-Waste Landfill Integrated Demonstration and will present the results in an annual remedial options study. The Remedial Options Evaluation includes three sub-tasks that are necessary to identify and evaluate technologies that have the potential for near-term, high-return and cost-effective solutions for the in-situ remediation of mixed-waste landfills. These tasks include: (1) participation on the MWLID and BWID technology support groups, (2) completion and annual modification of a remedial options study, and (3) completion of technology status reports for potential remediation technologies that may be eligible for outyear funding.

Summary Purpose/Need:
The goal of the MWLID is to demonstrate remediation technologies that have the potential for near-term, high-return and cost effective solutions for mixed-waste landfills. There are a large number of proposals, ongoing demonstrations and technologies emerging from R&D efforts that the MWLID must evaluate. With limited resources, the MWLID must select technologies that have the greatest potential for technical success and likelihood of transfer to the Environmental Restoration Programs.

The careful evaluation and selection of remedial technologies that will provide near-term, cost-effective solutions will benefit each facility that has mixed-waste landfills. The benefits will primarily arise from reduced environmental risks and implementation of an alternative remedial technology for less cost than a baseline technology.

Summary Result/Endpoint/Deliverable:
Successful completion of this activity will provide a basis for Environmental Restoration to select innovative technologies as part of the RCRA Corrective Measures Studies and compare them with existing proven baseline remediation methods. The deliverables include Remedial Options Studies for FY93 through FY96.

BDAT: NA

Functional Areas: containment
system analysis
innovative technologies

Target [illegible]ss Complex

Location site: Sandia National Laboratories (Liv)

Programs/Facilities Supported:
Potential cross-complex

ID: 212

Program Title: Sandia/Livermore Technology Specification for MWIP/OGT

Summary Description:
The Off-gas Treatment TSG is responsible for development of technologies to treat gaseous effluents from thermal processing devices. Off-gas systems will be designed and tested in conjunction with thermal processes such as plasma arc furnace, vitrification systems, and molten metal systems. A systems approach will be used to resolve technical issues including high temperature particulate removal and secondary waste stream minimization.

Summary Purpose/Need:
The Mixed Waste Integrated Program (MWIP) Technical Specification Groups (TSGs) are responsible for technology development systems planning for the National Mixed Waste Program. This project reflects a new structure for the TSG. The organization has been streamlined to enhance accountability and authority of the TSG leader. This should ensure that only necessary activities are acted on and productive participants are adequately funded. There are five TSGs linked and aligned with the Office of Waste Management (OWN) EM-30 modular treatment concept; Front-end Waste Handling, Chemical/Physical Treatment, Waste Destruction and Stabilization, Off-gas Treatment and Final Waste Forms. TSGs also provide the major mechanism for technical coordination between MWIP and EM-30 and other mixed-waste related EM-50 activities.

Summary Result/Endpoint/Deliverable:
Deliverables include Technical Area Status Reports (TASRs), Off-gas Strategy Document, Update Technical Status Report, and Performance Specification for Off-Gas Treatment Technology Demonstrations that meet Waste Treatment Needs.

BDAT: INCIN HLVIT RMETL

Functional Areas: offgas technology
system analysis
decision support

Target Site: Sandia National Laboratories (Albq)

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
MWL ID

ID: 213

Program Title: Dry Barriers Applications for Landfills

Summary Description:
To develop and demonstrate an air-enhanced dry barrier for application to landfills in arid environments. FY93 tasks will include the selection of the small-scale experiment design, development of apparatus and procedures for unsaturated transport properties, evaluation of dry barrier concept based on laboratory testing and if proved feasible, selection of a field demonstration site and configuration of the demonstration.

Evaluate the feasibility of the dry capillary barrier method for application at Mixed Waste Landfills in Arid Environments. Utilize small-scale testing of gas permeability and unsaturated hydraulic conductivity to evaluate lateral air-flow to remove downward flowing precipitation (recharge). Evaluate the potential applications of dry barriers for use in remediation of mixed-waste landfills.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
Deliverables include report findings on initial small-scale on testing of dry barrier concept, feasibility study, procedure on oscillator flow apparatus, and PROTEC information profile.

BDAT: STABL

Functional Areas: containment
system analysis

Target Site: Sandia National Laboratories (Albq)

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
MWL ID

ID: 215

Program Title: Magnetometer Towed Array

Summary Description:
Demonstrate the management towed array technology for detecting buried objects beneath hazardous and mixed waste landfills. Integrate a Global Positioning System to replace the current microwave navigation system. Modify data interpretation algorithms to meet waste site characterization needs. Improve hardware to provide real time (or near real time) data interpretation.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
Deliverables include demonstration of the GPS system, specifically the Towed Array system at the MWLID. The PROTECH information profile will be prepared.

BDAT: NA

Functional Areas: characterization
decision support

Target Site: Cross Complex

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
UST ID

ID: 217

Program Title: Waste Separation and Pretreatment Using Titanate Ion Exchangers

Summary Description:
Crystalline and amorphous hydrous titanium oxide (HTO) ion-exchange technology will be developed and demonstrated for removal of radioactivity (Cs-137)from supernate solutions and salt cake. There will be close interface with other OTD program areas such as the UST-ID program. Project objectives will be accomplished within four tasks: (1) Evaluation of the ion-exchange properties, especially the effects of pH and sodium content of waste feed on Cs removal; (2) Assessment of the feasibility of regeneration of the titanate ion exchangers; (3) Measurement of the radiation stability of the materials; and (4) Delivery of samples to Pacific Northwest Laboratories (PNL) for testing on actual Hanford Wastes.

Summary Purpose/Need:
Many tanks contain tens of millions of gallons of highly radioactive supernate liquid, salt cake, and sludges. The major radioactive constituents are isotopes of cesium, strontium, iodine, and transuranics. This project is focused on demonstration of technologies to remediate radioactive defense wastes currently contained in storage tanks, and radionuclides in grout low level waste (LLW) streams.

When technology demonstrated by this project is implemented, benefits will include: improved safety and reliability of separation processes for defense waste, and significant reduction of cost and time for implementation of waste remediation processes. Removal of Cs-137 early in waste processing will reduce the facility shielding requirements and diminish radiolysis of chemical reagents. These benefits will accrue from development of superior ion-exchange materials and the resulting compact, simpler processes based on ion-exchange.

Summary Result/Endpoint/Deliverable:
Deliverables include:

- Report on material properties of titanates delivered to PNL.
- Report on radiation stability of titanate materials.
- Report on feasibility of regenerating titanate materials.
- Report on effects of pH and Na content on performance of titanates.
- A monthly Progress Tracking System (PTS) report

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal

Target Site: Sandia National Laboratories (Albq)

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
MWL ID

ID: 218

Program Title: Neutron Activation Logging System for the MWLID

Summary Description:
Demonstrate, test and evaluate a neutron activation logging tool for in situ measurements of metals. Construct physical models to determine response factors. Perform field tests and assesses, evaluate and report results.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
Deliverables include a final data reduction and assessment and PROTECH Technology Information Form will be prepared.

BDAT: NA

Functional Areas: characterization

251

Target Site: Cross Complex

Location site:

Programs/Facilities Supported:
Potential cross-complex

ID: 219

Program Title: Analytical Service Program

Summary Description:
A key element for the DOE's Office of Environmental Restoration and Waste Management (EM) in performing its mission is to generate credible environmental data through effective and efficient sampling and analysis. The Laboratory Management Division (LMD) of the Office of Technology Development was established to provide the programmatic direction needed to establish and operate such an EM-wide program.

LMD's five-year plan for accomplishing its broad mission has been captured in EM's Analytical Services Program -- Five Year Plan (ASP Plan). The Analytical Services Program is divided into three complementary components: 1) Resource Management, 2) Analytical Support, and 3) Quality Assurance. EM's Analytical Services Program technical requirements are being developed through tasks implemented in the field and through Interagency Agreements. The program is decentralized but has national focus and direction where needed in order to gain wide regulatory acceptance, avoid duplication of effort, and foster interagency cooperation in such areas as the acquisition of commercial analytical services and laboratory accreditation.

Specific activities potentially applicable to mixed waste

: See the attached

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
- Develop a prototype local Sample Management System.
- Develop a prototype integrated Sample Management System.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

4695

Target Site: Cross Complex

Location site: Check and confirm

Programs/Facilities Supported:
Potential cross-complex

ID: 220

Program Title: BWID Non-Intrusive Sensing

Summary Description:
Enhancements will be made on existing geophysical and borehole techniques with the aim of developing non-intrusive techniques having greater selectivity and increased sensitivity. The BWID has specified needs for non-intrusive methods of locating and identifying buried contaminants. Also, better methods to characterize the subsurface geology, and equipment for in situ measurement of physical properties of tank wastes are needed.

Provide enhanced non-intrusive sensing techniques to aid in the characterization of remediation sites. Techniques should (1) improve quality of mapping waste distribution and boundaries, (2) reduce uncertainty in the non-intrusive location of small targets and enable characterization of small targets, (3) improve methods of characterization of subsurface geohydrologic features and properties and (4) develop in situ methods of characterizing contaminants. Specifically, in FY 1993 the following technologies will be evaluated: Broadband electromagnetics, Multigradient Magnetic Tensor Instrumentation, and Borehole Logging using neutron interrogation.

Summary Purpose/Need:
Improved methods of locating and identifying buried contaminants and better methods to characterize the subsurface geology, and equipment for in situ measurement of physical properties of tank wastes are needed. Reduced field costs are an objective.

Summary Result/Endpoint/Deliverable:
Deliverables include FY93 Reports on SQUID for Tensor Magnetometer/Gradiometer Test and Broadband Electromagnetic System Field System Operations.

BDAT: NA

Functional Areas: characterization
monitoring

253

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 221

Program Title: BWID Retrieval Demonstration: End Effector Evaluation

Summary Description:
Retrieval equipment end effectors will be evaluated for utility on a remote excavator vehicle. Information obtained will be incorporated into a remote excavator design specification.

Complete a cold test demonstration in simulated but typical buried waste of all applicable excavator end effectors such that a combination of apparati can be recommended for retrieval. Preliminary evaluation of end-effectors may be conducted at vendor simulated cold test pits at vendor sites and results of evaluation must be used to develop design specifications for a remote excavator with appropriate end-effectors. This is to be followed with a selected vendor demonstration in FY 1994.

These activities must be conducted in close coordination with the Robotics Program. Extensive private sector involvement is required.

Summary Purpose/Need:
Reduced environmental, health and safety risks are anticipated. Currently, the state-of-the art for retrieval techniques for buried transuranic waste is at the archeological dig stage. The types and combinations of end effectors required for retrieval are completely unknown. Furthermore, end-effectors once identified may require remitting for actual retrieval demonstrations.

Summary Result/Endpoint/Deliverable:
Deliverables include Vendor Excavation/End-Effector Evaluation Report, List of selected Vendors and Work Plan for FY94 activities at vendor furnished demonstration site, and Technology Evaluation Report on Cold Test Pit (Vendor Furnished Demonstration).

BDAT: NA

Functional Areas: retrieval
robotics

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 222

Program Title: BWID Contamination Control

Summary Description:
A Rapid Monitoring Unit and a Dust Control Unit designed in FY92 will be demonstrated at the RWMC Cold Test Pit for utility in TRU waste retrieval operations. Contamination control is essential to support transuranic retrieval operations. Complete the Rapid Transuranic Monitoring Unit and the Dust Control Unit that were begun in FY92. These units must be fabricated, performance tested, documented and field tested in conjunction with other Buried Waste Integrated Demonstration (BWID) retrieval demonstrations during FY93.

Summary Purpose/Need:
Contamination control is essential to support transuranic retrieval operations. It reduces risk to personnel, reduces contamination, reduces need for costly decontamination, and improves efficiency during remediation and other operations.

Summary Result/Endpoint/Deliverable:
Deliverables include Final Report on Dust Control Unit Demonstration and Recommendations for Hot Tests, Final Report on Rapid Monitoring Unit Demonstration and Recommendations for Hot Tests. After FY93 these field deployable units are to be handed off to the EM30 and EM40 activities.

BDAT: NA

Functional Areas: retrieval
containment
other

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 223

Program Title: BWID Dig Face Characterization

Summary Description:
Existing off-the-shelf sensors, data acquisition equipment and data manipulation software will be identified and evaluated for utilization in an integrated remotely operated, dig-face characterization system. Design and build a first generation characterization system to collect detailed, multi-sensor characterization data on an active remediation dig face, and use the data to detect and identify buried hazards as they are exposed by excavation.

Substantial involvement by the private sector in terms of off-the-shelf sensors, instrumentation, and data acquisition/manipulation software must be utilized. Conduct a dialogue with private sector to provide input to the development of the Sensor Design and Test Plan. University and private sector participation will be utilized fully per existing contracts.

Summary Purpose/Need:
Characterization efforts must be able to support progressive remediation efforts in the presence of unknown hazards. This information must be available in real-time to support remediation. A dig face characterization technology will ultimately reduce environmental, health, and safety risks during cleanup efforts at buried waste sites.

Summary Result/Endpoint/Deliverable:
Deliverable include Technology Status Report, Sensor Design and Test Plan, and Final Report on Proof-of-Concept Demonstration to be complete in FY93.

BDAT: NA

Functional Areas: retrieval
characterization
robotics

4695

Target Site: Cross Complex

Location site: Pacific Northwest Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 226

Program Title: BWID GRAPHITE DC ARC PLASMA AND GLASS MELTER TSR

Summary Description:
The Mark II DC Arc Melter will be evaluated in FY93 on typical buried waste forms including soils, metals, and combustibles. Off-gas losses and final waste form characteristics will be evaluated as part of this program. High vapor pressure metals (HVPM) surrogates will be evaluated as part of this procedure.

The primary objective of this task is the development of a novel DC graphite electrode plasma torch and furnace for the treatment of a variety of waste types including solids, liquids, and off-gas streams. A collaborative effort between PNL, MIT, and Electro™pyrolysis, Inc., (EPI) was initiated in FY-92 to accomplish this task. This task was conceived in a joint proposal involving all three parties, PNL, MIT, and EPI. In FY-92 the first phase of testing was initiated in the Mark I DC arc plasma furnace at the MIT Plasma Fusion Center. In FY-93: 1) complete evaluation of the graphite torch DC arc plasma process for BWID wastes based upon tests using the existing EPI arc technology at MIT, and 2) complete installation and testing of the Mark II plasma arc furnace. Conduct the development of a compliment of diagnostics to monitor the behavior of the plasma furnace process in FY-93.

Coordinate with work efforts to evaluate a method to enhance solids processing rates in joule heated melters using plasma to preheat the solids. The current workscope does not involve combining the two technologies and will clearly focus on the melter operating as a "stand-alone" system. Progress of this work will also be shared with the Arc Melter Vitrification activity.

Technical aspects of this activity will also be coordinated with Mixed Waste Integrated Program TTPs to assure that there is no redundancy in effort and that research results from these TTPs are complimentary in nature. Establish waste forms to be evaluated under this TTP, beginning with FY93, in consultation with the Final Wasteform Criteria Activity and in conformity with the recommendations of the BWID Ex-situ Treatment Technical Support Group. Characterize all final waste forms resulting from the test melts by appropriate chemical and physical analyses using established product performance test methods. Also, conduct offgas analysis for loss of HVPM surrogate additives.

Summary Purpose/Need:
The primary objective of this task is the development of a novel DC graphite electrode plasma torch and furnace for the treatment of a variety of waste types including solids, liquids, and off-gas streams. Benefits include waste volume reduction, high integrity waste form, destruction of organic components. Provides a baseline production for melter process design improvement and optimization.

Summary Result/Endpoint/Deliverable:

Deliverables include Final report on Mark I tests and recommendations for Mark II, Final report on Mark II tests and recommendations for "hot" test at BWID

BDAT: INCIN HLVIT DEBRIS

Functional Areas: waste destruction & stabilization
final form glass

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 227

Program Title: BWID Final Waste Form Criteria (Treatment and Pre-treatment Waste Form Integration)

Summary Description:
This activity will assist in the development of final waste form acceptance criteria, establishment of product performance test methods and the testing, distribution and demonstration of standard waste form compositions, including INEL soils. This task will provide for the integration of evaluations of pre-treatment and treatment technologies. This task should also establish and issue waste form performance requirements and technology testing and evaluation requirements. Data from the selected waste from criteria which are developed under this task will be re-inserted into the system selection filter and used to validate complete systems configurations. This work should also include participation in the ASTM standards activities related to storage, treatment and disposal of mixed waste. Provide information necessary to choose a proper final waste form for low level wastes, transuranic wastes and mixed waste. The objective will be achieved by two activities: (1) define final waste form acceptance criteria and establish the tests necessary to measure the product performance, and 2) use these criteria to produce uniform performance data for known final waste forms.

Summary Purpose/Need:
This task will provide for the integration of evaluations of pre-treatment and treatment technologies. Defines final waste form acceptance criteria and establishes the tests necessary to measure the product performance. The development of waste form acceptance criteria is critical for BWID as well as for the entire EM operation.

Summary Result/Endpoint/Deliverable:
Deliverables include Standard Waste and Soil Composition Report, Waste Form Guidelines (including acceptance criteria and performance assessment test methods), Literature Search Report, Criteria for Waste and Soil Compositions for Testing and Demonstration, Report on usefulness of standardized wasteforms in making comparisons between test melt data from different thermal treatment demonstrations.

BDAT: HLVIT STABL

Functional Areas: final form
system analysis
decision support

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 228

Program Title: BWID Retrieval Related Technologies

Summary Description:
Private vendor collaboration on overburden removal and side burden stabilization will be solicited and state-of-the-art techniques demonstrated at the RWMC Cold Test Pit. Also, an electrostatic enclosure will be fabricated and demonstrated at the Cold Test Pit. The electrostatic enclosure work is an ongoing BWID project that is ready to perform engineering scale experiments prior to pass-off of the technology to EM-30 and 40. Overburden removal can be simplified if accomplished in open air prior to placing a retrieval building over the site. Side burden confinement demonstrations can save processing thousands of cubic feet of clean soil by providing a vertical face at the boundaries of the excavation. Uncontaminated soil, just outside the pit boundaries, will be isolated by physical or cryogenic barriers. Therefore, no unnecessary soil will need to be exhumed. After FY-93 these field deployable techniques are to be handed off to the EM-30 and EM-40 activities and the TTP closed out.

Complete three tasks associated with retrieval technologies including:
Overburden removal demonstration, electrostatic enclosure demonstration, and side burden stabilization demonstration. Demonstrations involving test plans and final analysis reports are to be completed in FY-93. Demonstrate overburden removal and evaluate various overburden removal techniques for open air removal; Demonstrate the electrostatic enclosure and take glove box scale data and expand to engineering scale such that the technology can be passed to EM-30 and 40 in FY-94; Demonstrate the side burden stabilization with several technologies to provide vertical walls for the pit boundaries such that amount of side burden removed is minimized. Maximum utilization of private sector vendors in performing the overburden removal demonstration and the waste isolation containment wall demonstration must be employed.

Summary Purpose/Need:
Volume reduction in amount of material exhumed. Overburden removal can be simplified if accomplished in open air prior to placing a retrieval building over the site. Side burden confinement demonstrations can save processing thousands of cubic feet of clean soil by providing a vertical face at the boundaries of the excavation. Uncontaminated soil, just outside the pit boundaries, will be isolated by physical or cryogenic barriers. Therefore, no unnecessary soil will need to be exhumed.

Summary Result/Endpoint/Deliverable:
Deliverables include Report on Electrostatic enclosure tests, Report on Overburden Removal Demonstration, Report on Waste Isolation demonstration.

BDAT: NA

Functional Areas: retrieval
containment

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 230

Program Title: BWID Remote Characterization System (RCS)

Summary Description:
The Remote Characterization System (RCS), including carrier vehicle and sensors, will be evaluated at the Cold Test Pit site at the RWMC. Data will be collected both before and after overburden retrieval at the Cold Test Pit site. This is an integrated characterization technique which would allow for improved data quality through automated data acquisition, improved data display for interpretation, and increased safety. Demonstrate the Remote Characterization System (RCS) developed by the Buried Waste Robotics Program. This demonstration should involve an evaluation of the developed components such as the geophysical sensors (i.e. Ground Penetrating Radar, magnetometers), low-signature vehicle, the remote control system, and the global positioning system. Upon completion of this activity and submittal of the Evaluation Report this TTP will be closed out.

Summary Purpose/Need:
This is an integrated characterization technique which would allow for improved data quality through automated data acquisition, improved data display for interpretation, and increased safety.

Summary Result/Endpoint/Deliverable:
Deliverables include Evaluation Report for RCS.

BDAT: NA

Functional Areas: characterization
robotics

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 231

Program Title: BWID Multiaxis Crane Control System

Summary Description:

An existing crane will be retrofitted with remote handling capability to allow for movement on 26 separate axes. The task involves a complete evaluation of Multiaxis Crane Control System. This technology will allow operations personnel to perform all functions remote from the hazardous environment, increase safety of operations, and provide for retrieval methods applicable to multiple sites. The technology developed will be transferred to the private sector for further enhancement and development. Prepare Technical Preparedness and Status Report (TSR). From this report
identify vendor, technology, and site. In addition the TSR must also address the issues such as hazard classification and ES&H issues. Develop test plan incorporating the performance specifications. This must be a private sector
procurement. Final Demonstration Report must address the technology transfer potential. Upon completion of this activity this TTP will be closed out.

Summary Purpose/Need:
This technology will allow operations personnel to perform all functions remote from the hazardous environment, increase safety of operations, and provide for retrieval methods applicable to multiple sites.

Summary Result/Endpoint/Deliverable:
Deliverables include Technical and Status report, Final Demonstration Report, Final Technology Transfer Report.

BDAT: NA

Functional Areas: retrieval
front end handling
robotics

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 232

Program Title: BWID Remote Excavating System (RES) Demonstration

Summary Description:
Remote Excavating System, built by the Buried Waste Robotics Program will be evaluated for utility in overburden removal and waste excavation at the RWMC Cold Test Pit. The application of current state-of-the-art robotics technologies reduces the time required to perform waste removal and reduce personnel exposures to hazardous environments. Demonstrate the Remote Excavation System (RES) developed by the Buried Waste Robotics Program. This demonstration should involve an evaluation of the developed components such as the remotized Small Emplacement Excavator (SEE), the remote control station, and the end-effector teleoperations. Completion of the demonstration and submittal of the Evaluation Report will close out this TTP.

Summary Purpose/Need:
The application of current state-of-the-art robotics technologies reduces the time required to perform waste removal and reduce personnel exposures to hazardous environments.

Summary Result/Endpoint/Deliverable:
Deliverables include Evaluation Report

BDAT: NA

Functional Areas: retrieval
robotics

Target Site: Cross Complex

Location site:

Programs/Facilities Supported:
Potential cross-complex

ID: 234

Program Title: Improvements in Inductively Coupled Plasma Mass Spectrometry

Summary Description:
Inductively coupled-mass spectrometry (ICP-MS) is expected to have major applications for monitoring both stable and radioactive elements in waste remediation. The goal of this project is to improve precision and accuracy by at least one order of magnitude by constructing a new type of ICP-MS device. The ion beam from the ICP will be split into two parts. Each part will be directed into a separate mass analyzer set to monitor a different isotope. A prototype instrument is presently being assembled for these studies. The work is being performed cooperatively with an instrument manufacturer (VG Elemental) so that the improvements realized can become available to analysts.

Summary Purpose/Need:
The anticipated benefits include: 1) improved accuracy for determining ultra trace elements; and 2) fast isotopic analysis at high precision and sensitivity with minimal sample preparation. Improvements in precision and accuracy for laser ablation ICP-MS will eliminate the costs, time delay and opportunities for contaminating the sample incurred by the usual need to dissolve the sample. These capabilities will improve the accuracy and speed with which stable or long-lived radioactive isotopes can be monitored, which is necessary for proper storage or disposal of toxic or harmful elements. In addition, this instrumentation should facilitate several new applications that lack suitable analytical methodology, including measurements of elemental speciation and tracer experiments with stable isotopes in biological and environmental systems.

Summary Result/Endpoint/Deliverable:
Field Deployable Inductively Coupled Mass Spectrometer will be delivered.

BDAT: NA

Functional Areas: characterization
characterization, monitoring & assay

4695

Target Site: Cross Complex

Location site:

Programs/Facilities Supported:
Potential cross-complex

ID: 236

Program Title: Integrated Program - Characterization, Monitoring, and Sensor Technologies

Summary Description:
This task will develop and maintain an Integrated Program (IP) to stimulate the rapid coordinated development and application of characterization, monitoring, and sensor technologies (CMST) for EM program needs.

Summary Purpose/Need:
The emerging nature, wide diversity, and large potential cost savings of CMST mandates their development and implementation; an IP driven by EM needs is essential for sensible and cost effective resource allocation and management. Technology assessment in selected CMST areas will be performed. This IP can reduce EM costs by improving communication among technology developers and EM customers throughout the nation, fostering the acquisition of CMST from all sources, keeping R&D funding focused on highest priority needs (thus providing CMST in a timely fashion), minimizing duplication of effort, and enabling the most timely delivery of measurement results.

Summary Result/Endpoint/Deliverable:
Deliverables include annual update of CMST needs, complete technology assessment, updated IP plan, and provision of agenda and peer review for OTD Program Review of CMST.

BDAT: NA

Functional Areas: characterization
characterization, monitoring & assay

265

Target Site: Cross Complex

Location site:

Programs/Facilities Supported:
Potential cross-complex

ID: 237

Program Title: Expedited Site Characterization: Application and Continued Development of Rapid, Focused Site Characterization Methodology for Federal Facilities

Summary Description:
Argonne will develop and demonstrate this expedited site characterization (ESC) process at a federal facility chosen in conjunction with EM-50 staff. Prior to field demonstration of the methodology, Argonne will develop an ESC program specific to the chosen site. The program will emphasize the maximum use of nonintrusive technologies (e.g., surface geophysics, electronic cone penetrometer [ECPT], HydroPunch vegetation sampling), field analytical procedures, and daily integration of data via various computer programs. Private industry and universities will be used in the demonstration as needed to provide certain services such as ECPT, auger drilling, and field analytics.
After successful implementation of the field demonstration, Argonne will assist EM-50 in developing a request for proposals (RFP) and in technology transfer process.

Summary Purpose/Need:
The new methodology and procedure for remedial site characterization that has greatly decreased cost, time, and intrusive activities at Department of Interior and Department of Agriculture sites. The purpose of this project is to apply and continue to develop this approach for DOE and other federal facilities. The continued development and transfer of this approach will result in considerable cost and time savings to DOE and will allow needed remedial actions to proceed expeditiously.

Summary Result/Endpoint/Deliverable:
Deliverables include monthly reports, work scope for ESC demo, RFP for Argonne ESC demo, and ESC demo at federal facility.

BDAT: NA

Functional Areas: characterization

Target Site: Cross Complex

Location site:

Programs/Facilities Supported:
Potential cross-complex

ID: 238

Program Title: Optimization of Sampling Strategies

Summary Description:
Complete the chromic acid delineation work underway for FY92 in the Chem Waste Landfill (CWL) unlined chromic acid pit, and expanding the methodology for application to the mixed waste landfill. In FY93 work will focus on evaluating the results from sampling beneath the unlined chromic acid pit, and using the data generated to update information regarding the location of the chromic acid plume. At the MWL a combination of SitePlanner, sampling optimization routines, an analytical 1D transport model and risk assessment techniques will be used to determine optimal sampling strategies. This methodology will allow sample selection to both delineate and quantify the extent of contamination.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
Deliverables include risk assessment, comparison report, site planner evaluation, and updated report on virtual site for unlined chromic acid pit. The PROTECH Technology Information Profile will also be prepared.

BDAT: NA

Functional Areas: characterization
system analysis
decision support

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
UST ID

ID: 239

Program Title: UST: Truex Model Validation

Summary Description:
This task will provide for transfer of the Generic TRUEX Model (GTM) to other DOE pre-approved participants. These participants will perform tests to validate the GTM using actual waste. ANL will provide consultation, as required by the validating participants. ANL is requested to meet with the DOE-HQ PM to discuss the TTP scope and requirements.

Summary Purpose/Need:
The TRUEX method is being employed to treat TRU components of the UST mixed wastes around the DOE sites.

Summary Result/Endpoint/Deliverable:

Deliverables will include a Project Management Plan and Technology Profile for ProTech Info. System.

BDAT: LLEXT RMETL

Functional Areas: chemical physical treatment
radionuclide removal
system analysis

Target Site: Cross Complex

Location site: Brookhaven National Laboratory

Programs/Facilities Supported:
UST ID

ID: 240

Program Title: Polyethylene Encapsulation of Low-Level Single Shell Tank Wastes

Summary Description:
Polyethylene encapsulation is an improved process for stabilization of DOE mixed wastes. Recently, it has successfully treated hazardous and mixed waste streams such as sodium nitrate salts and sludges. In this project, applicability of polyethylene encapsulation will be assessed in several phases: 1) experimental determination of the effects of elevated thermal conditions and radiation dose on several key waste form, 2) developmental issues that can impact encapsulation processing parameters and long-term durability, and 3) pilot- or production-scale demonstration for SST LLW.

Summary Purpose/Need:
Polyethylene encapsulation of SST LLW at Hanford is among the options identified for treatment of the SSTs. The SST wastes contain sufficient levels of fission products (Sr-90, Cs-137) that the waste is self-heating (maximum equilibrium temperature of between 50 and 70 Celsius degree). Polyethylene encapsulation is technically and economically favorable to Portland cement grout solidification.

Summary Result/Endpoint/Deliverable:
Both the thermal and radiation effect at elevated temperature will be investigated and the scale-up feasibility of the polyethylene process will be determined.

BDAT: STABL

Functional Areas: final form
final form-grout or macro-encapsulation

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
BWID

ID: 242

Program Title: Arc Melter Vitrification: Melting and Vitrification of INEL Waste in the United States Bureau of Mines/ASME Municipal Ash Melter

Summary Description:
In this project the applicability of existing commercial production scale electric arc melter process technology to the treatment of mixed TRU contaminated wastes and soils (buried or stored) at the INEL and other DOE sites will be demonstrated. The arc melter processing demonstration tests for waste materials representative of mixed TRU contaminated wastes and soils are proposed as a three phase project. Testing is proposed to be performed in the existing three phase arc melter furnace test facility at the US Bureau of Mine (USBOM). This is a natural extension of an American Society of Mechanical Engineers (ASME) commercial incinerator waste ash vitrification demonstration project presently ongoing at the USBOM. There is no presently approved treatment or disposal criteria for buried mixed wastes and contaminated soils. However, the Arc Melter Vitrification process is a viable option to treat mixed TRU contaminated wastes and soils. It destroys hazardous organics and immobilizes TRUs and irrecoverable toxic metals in a highly non-leachable solid glass/ceramic, analogous to naturally occurring rocks (e.g., Iron Enriched Basalt) stable for geologic time frames.

Summary Purpose/Need:
The Arc Melter Vitrification process destroys hazardous organics and immobilizes TRUs and irrecoverable toxic metals in a highly non-leachable solid glass/ceramic, analogous to naturally occurring rocks (e.g., Iron Enriched Basalt) stable for geologic time frames. It also has a proven industrial experience base and is routinely acceptable to the public. The technology will clearly meet all regulatory acceptance criteria for final waste form and should be readily engineerable for safe operations. Proceeding to optimize from an existing design and operational experience base will provide a much sounder basis from which to design and license an operational facility on a shorter schedule. A more rapid schedule will save dollars for all parties involved, usually a strong acceptance driver.

Summary Result/Endpoint/Deliverable:
The demonstration tests will provide data at large scale for use in developing and verifying melter/process engineering design tools/models and scaling relationships that will be needed to design and license a full scale thermal treatment system. The deliverables will include test plans and test reports for Arc Melter Vitrification USBOM for each of the three phases, final evaluation report, and technology transfer workshop meeting report.

BDAT: HLVIT INCIN

Functional Areas: waste destruction & stabilization
final form glass

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 252

Program Title: Integral Fast Reactor Program, Pyroprocess Development

Summary Description:
The Advanced Liquid Metal Reactor is viewed as a solution to the future energy needs of the U.S., as an efficient device for the elimination of world stockpiles of plutonium, and as a means for burning the transuranic (TRU) elements present in spent LWR fuel. Pyrochemical processes are being developed that will facilitate the recovery of TRU elements from LWR fuel, conversion of weapons components to a harmless form useful for ALMR fuel, and recycle of ALMR spent fuel to capitalize on the breeding potential of the fast reactor. Concurrently, high-level waste management processes are being developed for the IFR pyroprocessing system that will minimize waste volumes and produce superior high-level waste forms acceptable for geologic disposal.

Summary Purpose/Need:
If the development programs continues successfully, the toxic and radioactive components will be contained sufficiently well to meet the regulations. For toxic components, the TCLP will be used to qualify waste forms and the treatment methods will be established as EPA BDATs.

°Cost benefit: Reduce capital cost for reprocessing and waste management facilities
°Waste volume reduction: To 10-15% of volume of unreprocessed spent fuel.
°Improved waste form: Inherently superior retention of long-lived radionuclides, elimination of actinides
°No secondary waste streams - maximized recycling of reagents.
°Elimination of actinides (U, Np, Pu, Am, Cm) from high-level waste.
°Improved (more stable, more leach resistant) waste forms
°Minimized waste volumes

Summary Result/Endpoint/Deliverable:
DOE-NE strategy calls for a pilot-scale demonstration of the IFR fuel cycle to be completed by 1997, processing almost 2 MT of spent EBR-II fuel. A similar demonstration of the recovery of actinides from spent LWR fuel will follow, to be completed around the year 2000. This will be followed by construction of a commercial prototype reactor and associated reprocessing plants, to begin operation in 2005. Commercial deployment of the technology will begin in 2010.

BDAT: NLDBR HLVIT

Functional Areas: other

Target Site: Argonne National Laboratory East

Location site: Argonne National Laboratory East

Programs/Facilities Supported:
Argonne's Waste Management Operations, Pilot scale demonstration which will treat waste at ANL

ID: 257

Program Title: Resin Exchange

Summary Description:
A separations scheme based on existing, commercially available materials that function as ion exchange media has been developed. Chemicals were developed by Argonne National Laboratory for use in separation of fission products and actinides from reprocessing solutions. The chemicals in their original form were to be used in organic solvent extraction processes in contact with aqueous acid solutions of radioactivity. Recently, a company has begun manufacturing solid media developed by ANL to which these chemicals are attached, allowing use of the extraction method without organic solvents. It is, however, necessary to use an acid solution and to limit the amount of non-acid nitrate.

Summary Purpose/Need:
This program will treat batches up to 200 liters of low level alpha containing wastes currently stored at ANL. These wastes cannot currently be treated.

Summary Result/Endpoint/Deliverable:
The endpoint of this project will be a pilot scale demonstration which will treat waste at ANL.

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 258

Program Title: Calcine Residue Leaching: High-Level Waste Volume Reduction for Calcine Processes

Summary Description:
Calcining Hanford tank wastes, to eliminate unresolved safety issues and destroy nitrate/nitrite, is being developed as part of the Hanford Tank Waste Remediation System (TWRS). Calcination is the only non-aqueous alternative proposed for this updated strategy.

Summary Purpose/Need:
The purpose of this task is to develop methods for removal of nonradioactive constituents from residues produced by calcining and aqueous leaching of Hanford tank wastes. Calcine residue volume can be significantly reduced by dissolving major non-radioactive components. The volume of residue directly controls the volume of high level waste glass generated from this treatment of tank waste. The calcine and leach is one option included in the emerging Tank Waste Remediation System strategy under development at Hanford.

This option is attractive in that it simultaneously eliminates unresolved safety issues arising from organic content and ferrocyanide/nitrate interaction and destroys nitrates, which pose a difficult disposal problem for Hanford grout. Also, the calcine option uses inherently simple equipment involving bulk thermal treatment and large tank batch processing rather than highly tuned and articulate systems needed for aqueous processes. Additionally, if Hanford tank wastes are calcined before final processing, issues such as energetic explosions, leakage and related questions would be resolved. This interim condition would be advantageous if key processing facilities were delayed or otherwise unavailable because of regulatory or financial impediments.

Summary Result/Endpoint/Deliverable:
The results of calcine residue treatment will be reported to HQ-DOE.

BDAT: HLVIT

Functional Areas: chemical physical treatment
removal of problem constituents

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
UST ID

ID: 259

Program Title: Calcination Process Development to Treat Hanford's Tank Waste

Summary Description:
The calcination/dissolution is one of three technologies for treatment of Hanford tank waste within the Tank Waste Remediation System (TWRS), ie. EM-30. Previous attempts at calcining high sodium material using conventional calciner concepts (ie. rotary kiln, spray tower, and fluidized bed) have had limited success due to the molten material plugging the reactors. In this project the feasibility for plasma arc calcination of a wide range of Hanford tank waste compositions will be determined. Large scale pilot plant tests will be conducted using three additional waste simulants that are representative of the majority of Hanford's single shell tank waste.

Summary Purpose/Need:
Calcination destroys the organics, ferrocyanides, and nitrates/nitrites which meet a primary objective in the TWRS program. Calcination/dissolution also can potentially minimize the volume of high-level waste planned for disposal in a geologic repository that results in significant overall cost savings.

Summary Result/Endpoint/Deliverable:
Deliverables include 1) a project management plan and test plans for plasma arc testings, 2) delivering calcine ash to the ESPIP for testing, 3) technology profile for Protech Info System, and 4) Mid-Year status report.

A final report will be issued that will be used by EM-30 to determine if plasma arc technology should be considered for implementation. Also, another report will be issued from WS&TC that describes the initial plasma arc demonstration of simulated Hanford tank waste that provides in-depth characterization of all streams (i.e., feed, off-gas, and final waste form).

BDAT: INCIN

Functional Areas: waste destruction & stabilization
primary organic destruction - high concentration
final form

4695

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 261

Program Title: Waste Analysis with Laser Raman Spectroscopy

Summary Description:
The OTD functions in this task include:

1) Act as the system lead to coordinate the deployment of spectrographic sensors in hot cell at Hanford.
2) Work with LLNL and SRL to deploy their technologies. 3) Provide requirements and interface specifications to instrument developers. 4) Provide surrogate materials to instrument developers and obtain real materials for hot cell tests. Also, prepare hot cell to receive instruments and provide engineering support to integrate and test instruments.
5) Provide support in obtaining permits and meeting safety and regulatory requirements for hot cell deployment.
6) Perform specialized studies in the hot cell on tank waste core samples using Raman spectroscopy contact and non-contact probes. Compare results with destruction/chemical analyses performed on same sample by Tank Farm Operations.
7) Oversee contracts to Florida State University ($ 150K) to perform Raman chemometrics studies.

Summary Purpose/Need:
A lead is required to coordinate the deployment of spectrographic sensors.

Summary Result/Endpoint/Deliverable:
Deliverables include a test plan and Technology Profile for ProTech Info System.

BDAT: NA

Functional Areas: characterization
characterization, monitoring & assay

Target Site: Cross Complex

Location site:

Programs/Facilities Supported:
Potential cross-complex

ID: 262

Program Title: Magnetic and Nonmagnetic Melt/Slag Treatment of Mixed Wastes.

Summary Description:
Studies show that large quantities of metals, both ferrous and nonferrous, exist in the DOE inventory and that much more metal will be generated by future remediation, decontamination and decommissioning activities. The potential for recovery and recycle of these metals needs to be fully understood.

The objective of this project is to identify a reasonable cross section of the types of metal wastes which will ultimately require treatment. It will also determine through experimentation, the partitioning efficiency, waste volume reduction, and other important features achievable through various melt-slag and slag fluxing treatments.

Summary Purpose/Need:
There is a need to demonstrate new decontamination technologies that generate smaller volumes of secondary wastes. These technologies need to be tested on a broad range of DOE wastes and containers. Potential benefits from this work are a huge reduction in waste volume and recycle of a substantial amount of metal which would otherwise be disposed of as a mixed waste.

Summary Result/Endpoint/Deliverable:
Both the laboratory-scale demonstration (to be preceded by technology assessment report) in FY93 and a pilot-scale demonstration in FY94 will be conducted.

BDAT: RMETL STABL

Functional Areas: final form
melt slag-ferrous metals
melt slag-non-ferrous metal

Target Site: Cross Complex

Location site: Pacific Northwest Laboratory

Programs/Facilities Supported:
UST ID

ID: 263

Program Title: EIX Nitrate Destruction: Nitrate/Nitrite Destruction by Electrochemical Ion Exchange

Summary Description:
Much of the nitrate contained in the double and single-shell tanks at Hanford will be disposed of as grout in near surface vaults. Nitrates/nitrites are the major or one of the major contributors to the environmental risk. This task will participate in assessment/comparison of processes for the destruction of nitrate will be accomplished. The electrochemical ion exchange and destruction process for nitrates will be then developed. A competitive procurement is presently planned for the vendor testing and technology transfer.

Summary Purpose/Need:
Nitrates/nitrites at Hanford's Double and Single-Shell Tanks could be effectively destroyed by a Electrochemical Ion Exchange (EIX) nitrate destruction process. The purpose of this technology program is to assess the ability of the electrochemical nitrate destruction process to treat and destroy the nitrates/nitrites contained within the underground storage tanks. The successful implementation of this technology will include or eliminate the environmental risks due to nitrates in the low level waste form. A reduction in the volume of the low level waste form will require that additional cesium be removed from the waste and that new grout formulations be developed for higher salt concentrations.

Summary Result/Endpoint/Deliverable:
The nitrate destruction process will be successfully demonstrated. Technology transfer will be primarily from the vendor to the Hanford and other DOE sites.

BDAT: CHOXD CHRED

Functional Areas: chemical physical treatment

Target Site: Hanford

Location site: Pacific Northwest Laboratory

Programs/Facilities Supported:
UST ID

ID: 264

Program Title: UST: Tank Waste Processing Analysis

Summary Description:
This task will evaluate pretreatment requirements of Hanford tank waste on a tank-by-tank basis. Completion of this task will (1) identify the processing required for each tank to meet pretreatment criteria; (2) evaluate the effects of change in pretreatment criteria on processing requirements; and (3) optimize the deployment of distributed processes for pretreatment. Data from other DOE-funded associated tasks will be factored into this task, as indicated by the UST-IDC and/or UST-ID DOE-HQ PM.

Summary Purpose/Need:
Evaluation of pretreatment requirements of Hanford tank wastes is needed.

Summary Result/Endpoint/Deliverable:
Deliverables include Issue Project Management Plan, Preliminary Engineering Design and Cost Estimate report for Clean Option, technology profile for ProTech Info System, and Status Report.

BDAT: NA

Functional Areas: system analysis
decision support

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
Emphasis on Hanford, Idaho, and Rocky Flats sites where HLW, TRU and LLW separations needs are currently being defined for UST and processing wastes.

ID: 265

Program Title: Efficient Separations/Processes Integrated Program (ESPIP)--Coordination, Program Development, and Technology Evaluation Tasks.

Summary Description:
This task will provide the coordination, development, identification of functional requirements, and technology evaluation for the Efficient Separations/Processing Integrated Program.

In its integrating role, ESPIP will coordinate separations and waste-form packaging Research, Development, Demonstration, Testing, and Evaluation (RDDT&E) activities within the EM Office of Technology Development (OTD). ESPIP will interface closely with other OTD IDs and IPs. It will also take into account activities and needs in Waste Operations (WM) and Environmental Restoration (ER) as well as other DOE offices, e.g., Nuclear Energy, Energy Research, and the Division of Production.

Summary Purpose/Need:
The challenge for ESPIP is to develop Separations and Waste-Form Technologies and Processes (SWFTP) to process and immobilize a wide spectrum of radioactive and hazardous defense wastes to meet environmental and societal demands without placing impossible demands on the Federal budget. To do this presently available technology must be augmented by emerging advanced technologies that show promise of a very large impact. If advanced technologies can be used in pretreatment of high-level waste, there is a potential to save several billions of dollars by dramatically decreasing the volume of high-level waste that must be prepared and maintained in long-term storage. At the same time there is promise that the remaining low-level waste can be substantially ameliorated.

Summary Result/Endpoint/Deliverable:
The IPC will monitor technical progress via monthly reports and attainment of milestones as defined in ESPIP TTPs. The SWFTP technology, upon successful implementation, will be transferred to U.S. industry thereby increasing the U.S. competitiveness.

BDAT: NA

Functional Areas: other
radionuclide removal
high efficiency separation

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 267

Program Title: Compact Processing Unit Demonstration

Summary Description:
This task will design, build, and demonstrate a Compact Processing Unit for cesium ion exchange. The compact processing Unit for cesium ion exchange will address removal of cesium from Hanford tank waste supernatant. PNL will develop the specification for the CPU and develop a request for proposal for industry participation (i.e., the fabrication of the CPU). PNL will interact with SRL and industry to obtain ion exchange data necessary to design the Compact Processing Unit for Cesium ion exchange. Guidance and authorization to proceed with design and procurement specification will be issued pending review and approval on the Project Plan complete with project milestones.

Summary Purpose/Need:
The demonstration of Compact Processing technology is required before a decision to implement compact processing for the tank waste remediation system can be justified.

Summary Result/Endpoint/Deliverable:
Deliverables include Issue Project Management Plan and technology profile for Protech Info System, specification for the CPU, request for proposal for industry participation, and a demonstrated Compact Processing Unit.

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal

Target Site: Hanford

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 268

Program Title: Advanced Chemical Separation: Simulation of Performance of Unit Operations and Systems of Such Operations proposed to effect Advanced Chemical Separation of Hanford Waste Streams

Summary Description:
This task is to develop computer submodels of chemical separation processes that are integrated into a total waste treatment system from retrieval to the final disposition. The submodels will include all inputs, emissions, discharges, and products. The submodels will also focus on a detailed representation of waste pretreatment and separation processes. The submodels will be integrated into a total system model developed by WHC which will assess how variations in the waste separation or pretreatment portion of the system effect costs and mass balances. The total system model will also consider facility construction costs and decommissioning costs.

Summary Purpose/Need:
A particular unit process/modification can be best evaluated by conducting a complete mass balance analysis of the whole waste treatment streams and analyzing a wide range of issues in plant operation. By putting the analysis in the form of computer whose component submodels simulate unit processes, it can be made into a systematic analytical test bed. This will be used to evaluate process changes ranging from minor modification to a new concept. Thus, it will help to save resource by discriminating effective treatment processes from those that look good individually but weak in an overall system's sense.

Summary Result/Endpoint/Deliverable:
Simulation of performance of unit operations will be conducted to wastes from the Hanford single shell tanks TRUEX system, UST-ID programs, and other pretreatment activities in support of waste management operation.

BDAT: NA

Functional Areas: system analysis
decision support

281

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
Potential cross-complex

ID: 271

Program Title: PNL Technology Specification for MWIP

Summary Description:
This task supports the involvement of requested PNL staff in the extensive planning, reviews, and systems evaluations required to continue the Mixed Waste Integrated Program (MWIP). The task will be combined with similar tasks at other sites to provide the technical staff to support OTD HQ in quantifying the extent of the mixed waste problem, preparing and reviewing documents, identifying specific user requirements, and developing a comprehensive and efficient integrated program. Ultimately, one or more integrated demonstrations focused on specific mixed waste streams may be started.

Summary Purpose/Need:
This task will help ensure that the Mixed Waste Integrated Programs meet real needs by making experienced PNL personnel and resources available. There will be improved consensus on priorities and the best options for demonstrations and programs, and the results achieved within the demonstrations and programs will be more widely accepted. Technologies developed will be transferred more easily. These benefits also translate to lower development and demonstration costs, and technologies will be implemented more rapidly.

Summary Result/Endpoint/Deliverable:
Successful transfer of technologies among the DOE sites and with the commercial sector.

BDAT: NA

Functional Areas: other
decision support

Target Site: Sandia National Laboratories (Albq)

Location site: Pacific Northwest Laboratory

Programs/Facilities Supported:
MWL ID

ID: 272

Program Title: Detection and Quantification of High-Z metals with X-Ray Fluorescence

Summary Description:
Employ the method of X-Ray fluorescence (XRF) to the in-situ characterization of SNL landfill soil for heavy metals such as chromium, mercury, arsenic, lead, cadmium, and antimony. FY 93 activities include participation in the tests planned for December,1993, and improvement of the instruments capabilities by incorporation of a cryogenically cooled GeLi or SiLi detector in the instrument.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
Deliverables include status and final reports and preparation of the PROTECH technology Information Profile.

BDAT: NA

Functional Areas: characterization Hg,Pb,Cr,As,Sb,Cd
monitoring

Target Site: Sandia National Laboratories

Location site: Pacific Northwest Laboratory

Programs/Facilities Supported:
MWL ID

ID: 273

Program Title: On-site Analysis of Metals Using ASV

Summary Description:
In collaboration with New Mexico State University, develop and demonstrate the effectiveness of absorptive stripping voltammetry (ASV) to determine the leachable metals on soils to identify inorganic contaminant source terms and plumes underlying hazardous and mixed waste landfills at Sandia National Laboratories. Demonstrate the ASV techniques in a field screening laboratory system at Sandia.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
Deliverables include Phase II report and completion of Pro-Tech Profile Information Form

BDAT: NA

Functional Areas: characterization

4695

Target Site: Cross Complex

Location site: Various

Programs/Facilities Supported:
Potential cross-complex

ID: 275

Program Title: Mixed Waste Destruction (Vitrification)

Summary Description:
This task supports the MWIP in the Enhanced Waste Form Technical Area by applying vitrification to low-level mixed wastes. The task proposes development and demonstration of a thermal waste treatment system using a joule heated glass melter. This is planned as a joint effort with PNL, SRS, and LANL.

The main objective of this effort is to assess vitrification as a "best demonstrated technology" for treatment of a wide range of low-level mixed waste streams. Vitrification process has been successfully tested for destruction of nitrates and organic compounds while immobilizing radionuclides and heavy metals. Joule melters, unlike incinerators, require no further treatment, have high volume reduction / waste minimization, and are adaptable to treat a wide range of wastes. Also a joule melter can be permitted as a thermal treatment unit under 40 CFR 264 Subpart X, avoiding problems associated with permitting incinerators. Finally, Testing and demonstration can be performed cost effectively with existing infrastructure at PNL and SRS.

Summary Purpose/Need:
The Rocky Flats Plant (RFP) is out of compliance with the RCRA because most RFP mixed wastes are prohibited from land disposal, and they have been stored in violation of the law's storage prohibition. A FFCA between the DOE and the EPA has allowed RFP to continue operations with the condition that means be developed to treat the Land Disposal Restricted (LDR) wastes by pursuing suitable treatment technologies.

Summary Result/Endpoint/Deliverable:
Deliverables include:

1. Technical specifications for vitrification testing (Project Plan)
2. End of year status report and Monthly Status Reports required by DOE-HQ.
3. Technology transfer to private sectors.

BDAT: HLVIT INCIN

Functional Areas: waste destruction & stabilization
thermal treatment unit - high residue
final form glass

285

Target Site: Rocky Flats

Location site: Rocky Flats

Programs/Facilities Supported:
RFP LDR Compliance Program

ID: 277

Program Title: Polymer Solidification

Summary Description:
This activity includes development and support for implementation of encapsulation technologies for several radioactive mixed waste forms using both thermoplastic and thermosetting polymers. Activities will focus on identification of compatible production-scale drying technologies, refinement of a leachability model for heavy metals, evaluation of waste form durability, and laboratory-scale treatability studies. The current developmental focus is on polyethylene microencapsulation of nitrate salt waste and macroencapsulation of combustible debris.

Summary Purpose/Need:
The goal of this development activity is to demonstrate the ability of polymer encapsulation to meet applicable RCRA, LDR, transportation and disposal site waste acceptance criteria.

Summary Result/Endpoint/Deliverable:
- Complete equipment evaluation summary - 8/93
- Complete waste form durability study - 9/93
- Complete treatability study summary - 9/93
- Data sufficient to allow comparison with other candidate technologies and down-select of preferred technology.

BDAT: STABL

Functional Areas: final form
final form-grout or macro-encapsulation

'695

Target Site: Cross Complex

Location site: K-25/Y-12 Plant (Oak Ridge)

Programs/Facilities Supported:
Potential cross-complex

ID: 280

Program Title: Waste Stream Diagnostics and Control for Treatment of Mixed Waste

Summary Description:
This project scopes include the following:

1. Determine diagnostic requirements for mixed waste treatment.
2. Establish performance specifications for statistical stream sampling and determine if the technology is available or requires development to support mixed waste treatment needs.
3. Initiate technology development projects to meet the needs for processing mixed waste; specifically, evaluate industrial capabilities for on-line laser, ultrasonic, and other appropriate diagnostics and identify selected RDDT&E targets.
4. Demonstrate, test and evaluate the utility of instrumentation to perform the required measurements and survive in the harsh environment of the processing area.

Summary Purpose/Need:
Some technology development for characterization of effluents, final waste forms for disposal, etc., will be required before a mixed waste treatment facility can be licensed to operate. Performing measurements during processing will ensure treatment effective in producing a final waste form that meets waste acceptance criteria for disposal. It will also improve reliability and efficiency of processing of mixed waste and help minimizing secondary waste. In addition, it will save cost over pulling samples and waiting for analysis from a centralized laboratory, and down-time is reduced by obtaining time measurements during processing.

Summary Result/Endpoint/Deliverable:
Deliverables will include:

1. Report on diagnostic requirements for treatment of mixed waste
2. Report on diagnostic requirements for plasma arc furnace operations
3. Report on diagnostic requirements for sampling and diagnostics for vitrification operations
4. Instrumentation plan including performance specifications for procurement of technology development

BDAT: NA

Functional Areas: monitoring
characterization, monitoring & assay

Target Site: Hanford

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
UST ID and USTs throughout the DOE Complex

ID: 281

Program Title: Comprehensive Sludge/Supernate DT&E

Summary Description:
This task will focus on developing a comprehensive sludge/supernate processing flowsheet for the contents of radioactive waste stored in USTs throughout the DOE Complex. Primary emphasis should be on Hanford tank waste. A meeting will be conducted at the Oak Ridge site in mid-November to determine the optimum path such as scope, schedule, and milestones.

Summary Purpose/Need:
The UST mixed wastes treatment technologies are being identified and demonstrated for feasibility.

Summary Result/Endpoint/Deliverable:
Deliverables will include a Project management Plan, Technology Profile for Protech Info System, and a comprehensive sludge/supernate processing flowsheet .

BDAT: NA

Functional Areas: system analysis
decision support

4695

Target Site: Cross Complex

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
Potential cross-complex

ID: 282

Program Title: ORNL Program Support for MWIP (New Name: Plasma Design & Test)

Summary Description:
The following tasks will be added to the existing Plasma Arc Demonstration Program:
1. A redesign of the combustion chamber of the present Plasma test chamber at RETECH Co., Ukiah, CA, for full barrel addition.
2. Modify the offgas system to include sampling capability and off gas treatment testing. During the testing phase, enhanced emissions data will be obtained.
3. A test plan with data requirements will be written. This test plan will be coordinated with the Waste destruction/Stabilization and Off Gas Treatment Technical Support Group Leaders and reviewed at HQ by the MWIP Program Manager.
4. The test will be performed in accordance with the test plan and a report will be provided.
5. The design of a prototype plasma system will be accelerated and data requirements will be factored into the test program.

Summary Purpose/Need:
There is no EM-30 plasma work supporting the National Mixed Waste Program or the Mixed Waste Treatment Project. This technology would replace one or more thermal units in the baseline prototype treatment plant. The advantages of this technology over the baseline technology:
1. Generates stable metal and inert slag (glass) waste forms from mixed wastes without further treatment.
2. Provides a technology that will minimize waste characterization and pretreatment requirements, minimizing opening waste containers.
3. Demonstrates an omnivorous technology that could replace several thermal technologies in the Mixed Waste Treatment Plant baseline, minimizing waste interfaces and transfers, thus increasing the reliability and availability of the plant.
4. Increases the thruput without enlarging the process footprint.

Summary Result/Endpoint/Deliverable:
Deliverables include
1) Modification design,
2) New test equipment,
3) Test Plan, and
4) Test Report

BDAT: INCIN

Functional Areas: waste destruction & stabilization
thermal treatment unit - high residue
final form glass

Target Site: Cross Complex

Location site: K-25/Y-12 Plant (Oak Ridge)

Programs/Facilities Supported:
Potential cross-complex

ID: 283

Program Title: Problem-Directed Chemical Characterization - Rapid Response (Laser Rangefinder Add-On)

Summary Description:
Support the Characterization IP in the development of a coherent laser range sensing system for application to topological surface characterization. The coherent laser rangefinder shall be developed in concert with NASA through an interagency agreement. ORNL support shall include definition of application requirements, technical assistance to NASA in the form of feasibility analysis and design reviews, coordination and integration of this development effort with related sensor system developments funded through the OTD Robotics IP.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:
Deliverables include Project QA evaluation, CLR performance requirements specification, and FY 93 technical status summary report.

BDAT: NA

Functional Areas: characterization

Target Site: Cross Complex

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
UST ID

ID: 284

Program Title: Radioactive Sodium Nitrate Waste Treatment

Summary Description:
USTs at Hanford contain large amounts of highly alkaline, nitrate based liquid wastes which are classified as mixed. To remediate the UST mixed wastes the liquid phase will be placed in grout and the acid-washed solid (TRUEX process) in glass. In this task, the nitrate component will be reduced to ammonia, and the nitrate concentration will be below drinking water standards. The radioactive species such as Pu and Sr will be trapped in the solid phase during the reduction. However, Cs present in solution may require decontamination by selective adsorption on a hexacyanoferrate salt.

Summary Purpose/Need:
Nitrate is a difficult environmental problem due to its high mobility and the presence of a large quantity of sodium nitrate at various DOE facilities. This technology will introduce a simple process for the complete conversion of nitrate to gaseous ammonia while eliminating the production of sodium hydroxide. In addition, the solid remaining is in inert waste form and free of nitrate. The process is self heating, amenable to control, and cheaper to process. The process is conceptually superior to vitrification since high temperature is not required; It is also conceptually superior to grout since more than 50 volume percent reduction can be obtained.

Summary Result/Endpoint/Deliverable:
The denitration process will reduce the nitrate concentration of Hanford SST wastes to below 44 ppm. Also, bench-top implementation and pilot-scale operation will be demonstrated.

BDAT: CHRED

Functional Areas: chemical physical treatment
removal of problem constituents
material recycle

Target Site: Cross Complex

Location site: Nevada Test Sites

Programs/Facilities Supported:
Potential cross-complex

ID: 285

Program Title: Associated Particle Imaging (API) Development

Summary Description:
The Associated Particle Imaging (API) system is a nonintrusive technique to identify and characterize the contents of sealed barrels and other closed containers in which the contents are poorly known.

This project requires the design, development and production of a reliable, long-lived, sealed-tube neutron generator (STNG) to produce the fast (14 MeV) neutrons and associated alpha particles that dynamically collimate the neutrons to enable construction of the images. New approaches to the alpha detection will be investigated with two objectives: a substantial increase in the speed of response and an increase in the maximum counting rate. Software techniques will be developed to enhance image quality without the necessity to make hardware changes.

Summary Purpose/Need:
The API system is an active, nonintrusive, single-side neutron-based interrogation system that will permit analysis for target materials of interest; to identify their chemical compositions and display them in moderate resolution in a three dimension format.

Summary Result/Endpoint/Deliverable:
Deliverables include the STNG/HVPS subsystem and a van modified for API.

BDAT: NA

Functional Areas: characterization

4695

Target Site: Cross Complex

Location site: Nevada Test Sites

Programs/Facilities Supported:
Potential cross-complex

ID: 287

Program Title: Remote Sensing Systems Development

Summary Description:
Existing remote sensing systems (both nuclear and non-nuclear) and their associated processing techniques will be evaluated and optimized to address site characterization and monitoring needs.
Integration of remote sensing data with geographic information systems will also be developed. Comprehensive technology reviews will be undertaken to identify new sensors for characterizing both radioactive and non-radioactive contaminants as well as their environmental effects. Promising approaches will be pursued and developed.

Summary Purpose/Need:
The focus of this project is the coordinated development and evaluation of existing sensor systems and new remote sensing technologies for environmental restoration and waste management applications. Airborne remote sensing systems are useful for surface and subsurface characterization studies. Airborne studies permit rapid, high resolution, non-intrusive thorough coverage of large areas. Potential applications exist at all DOE sites.

Summary Result/Endpoint/Deliverable:
The Multispectral Scanner Application and Calibration will be improved, and Imaging Spectrometer will be developed. The Resolution Gamma will be developed, and the subsurface mapping will be developed.

BDAT: NA

Functional Areas: characterization
characterization, monitoring & assay

293

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 293

Program Title: Buried Waste Integrated Demonstration Thermal Kinetic Process Studies

Summary Description:
This project support three TTP subtasks: 1) understanding of the behavior of transuranic radionuclides and heavy metals within the melt, 2) identification of ex situ vitrification technical issues facing technology application to Subsurface Disposal Area buried waste forms, and 3) study of Vapor/liquid transport phenomena during in situ vitrification (ISV). To meet these objectives, a simultaneous analytical modeling effort and supportive experimental effort are planned.

Summary Purpose/Need:
Vitrification (ex situ and in situ) is being considered as a potential remedial technology for treatment of buried wastes. The resultant waste form has been shown to be extremely durable and leach resistance. Vitrification is particularly effective for the treatment of toxic metals and radionuclides. Unlike organic and other inorganic contaminants, metals cannot be destroyed. Therefore, the ability of the vitrification waste form to immobilize these hazardous elements is very important in reducing the exposure potential to the environment.

The ISV technology could result in a significant cost savings for remediation of selected DOE contaminated sites. Additional cost savings could result from other applications such as buried waste processing. The phenomenological understanding resulting from this work can be applied to other ISV remediation applications.

Summary Result/Endpoint/Deliverable:

Deliverables include

1 Prepare Technology Profile for ProTech Information System
2 TRU Melt Release Phenomena Letter Report
3 Final Report on ISV Lab Test Series 1 - Vapor Release Study
4 Modified Computer Code Modeling ISV Vapor Release Phenomena Report
5 Parametric Studies Report on ISV Melt Pressurization using TOUGH
6 ISV Laboratory Test Report Confirming the Use of TOUGH in Resolving ISV Melt Pressurization Issues
7 Preparation of Closure Report for Melt Pressurization Potential

BDAT: HLVIT

Functional Areas: final form
system analysis

4695

Target Site: Savannah River

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
VOC in Non-Arid Soils ID

ID: 295

Program Title: Cold Plasma Destruction of Savannah River Off-Gas VOCs

Summary Description:
Demonstration of silent discharge plasma (SDP) technology as an effective means of destroying gaseous-based hazardous organic wastes (viz. VOCs) at the Savannah River Site (SRS) and to perform a technology demonstration in the field at SRS. The goal for the field demonstration is to treat a waste stream containing VOCs at 100 ppm concentrations at a flow rate in the range 200 - 500 SCFH. In cooperation with EPRI, we would conduct a parallel effort to apply this cold plasma waste treatment technology to a small-scale industrial field demonstration (e.g. a small manufacturer in Southern California).

Summary Purpose/Need:
The off-gas treatment portion of Phase II of the Savannah River Site Integrated Demonstration deals with hazardous organic wastes, or volatile organic compounds (VOCs) which arise from off-gases liberated from the arid soil and the groundwater. Present waste treatment technologies (such as incineration or carbon absorption) suffer from lack of public acceptance, degree of destruction, or ability to minimize the final waste stream. In laboratory tests, cold (or non-equilibrium) plasmas, specifically the Silent Discharge Plasma (SDP), have demonstrated their effectiveness in destroying hazardous organic wastes, particularly chlorocarbons.

Summary Result/Endpoint/Deliverable:
Upon successful demonstration at SRS, the process will be ready for technology integration and commercialization.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
alternative organic destruction - low concentration

Target Site: Cross Complex

Location site:

Programs/Facilities Supported:
Potential cross-complex

ID: 300

Program Title: 3D, 1C/3C Seismic: Three-Dimensional, One- and Three-Component Reflection Seismic for Non-Intrusive Characterization of Environmental Restoration Sites

Summary Description:
The objective of this task is to demonstrate the effectiveness of three-dimensional, one- and three-component reflection seismic data for the non-intrusive characterization of environmental restoration sties. Waste pit boundary locations, waste volume characterization and areas/stratigraphy/structure that affect contaminate plume migration can be identified through analyses of seismic wave attributes.

Summary Purpose/Need:
The reflection seismic technique is by far the most advanced technique used for hydrocarbon exploration. It has seen more applications recently for shallow exploration purposes due to the increased availability of instrumentation, data processing, and data interpretation software suitable for the particular problems encountered in the near-surface region. In addition, the combination of multi-dimensional and multi-component data creates a matrix which contains considerable more information about the subsurface. The Reservoir Characterization Project (RCP) at the Colorado School of Mines (CSM) was initiated for multicomponent seismology research applications to reservoir characterization, especially fractured reservoirs.

While environmental restoration sites are not hydrocarbon nor coalbed reservoirs, the 3D/3C seismic technology used for the definition of the latter can be extended to such sites.

Summary Result/Endpoint/Deliverable:
Field demonstration will be completed. Final reports on both the 3D/1C and 3D/3C data interpretation will also be prepared.

BDAT: NA

Functional Areas: characterization
containment

Target Site: Savannah River

Location site: Argonne National Laboratory East

Programs/Facilities Supported:
VOC in Non-Arid Soils ID

ID: 302

Program Title: Pulsed Ultraviolet Irradiation Gas-Treatment Technology

Summary Description:
The objective of this project is to develop and demonstrate an advanced pulsed ultraviolet (UV) irradiation process for effective destruction of chlorinated volatile organic compounds (VOCs) in the effluent gas from the soil vapor-extraction system at the SR site. The project consists of three main tasks: site preparation, demonstration tests, and technical support.

Summary Purpose/Need:
Results from the recently completed Phase I of the soil-cleanup Integrated Demonstration project at the Savannah River (SR) site indicate the need for an effective treatment for off-gas generated from directional boring activities.

Summary Result/Endpoint/Deliverable:
Final Technology Evaluation Report on this technology will be prepared.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
alternative organic destruction - low concentration

Target Site: Savannah River

Location site: Idaho

Programs/Facilities Supported:
VOC in Non-Arid Soils ID

ID: 305

Program Title: Soil Bioreactor Studies

Summary Description:
Samples of contaminated soil and groundwater from the Savannah River site will be obtained and microbial degradation evaluated in differential soil bioreactors developed at the INEL. Assessments of the potential and time-scale in-situ bioremediation of trichloroethylene (TCE) by indigenous bacteria will be estimated by observing the biodegradation within the differential bioreactors. Nutrient limitations (principally nitrate and methane) will be studied for their effect on process rate. By establishing the kinetics of growth and biodegradation, recommendations will be made concerning nutrient delivery (e.g., pulsing) requirements. During FY-1993, the effects of subsurface heterogeneities will be assessed for their impact on the in-situ treatment process. The FY-1992 effort is jointly supported by this TTP as well as SR-0566-AA.

Summary Purpose/Need:

Summary Result/Endpoint/Deliverable:

BDAT: BIODG

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration
other

Target Site: Savannah River

Location site: Pacific Northwest Laboratory

Programs/Facilities Supported:
VOC in Non-Arid Soils ID

ID: 313

Program Title: High Energy Corona for Destruction of VOCs in Process Off-Gases

Summary Description:
The scope and objective of this task is to develop and conduct field tests on a prototype off-gas treatment unit capable of treating 5 scfm or greater quantities of water-saturated off gas containing up to a total 500 ppmv of trichloroethylene (TCE) and perchloroethylene (PCE).

The objectives of the proposed task will be accomplished in three stages. In the first stage, the best design embodiment for off-gas treatment will be determined. In the second stage, the prototype off-gas treatment unit will be designed, built, and tested to obtain baseline performance data. The third stage will involve the actual field implementation and testing of the prototype unit.

Summary Purpose/Need:
The prototype will represent an innovative, high-energy corona technology to completely oxidize the volatile organic compounds (VOC) with no further treatment required, other than acid-gas scrubbing (if effluent HCl levels require this). The advantages of the delivered system would include eliminating need for external off-gas heating, cooling, or drying. There will also be no need for additives, catalyst, sorbents or any regenerables. It will also consume low energy.

Summary Result/Endpoint/Deliverable:
A final summary report will be submitted at the end of the task.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
alternative organic destruction - low concentration
offgas technology

Target Site: Cross Complex

Location site: K-25/Y-12 Plant (Oak Ridge)

Programs/Facilities Supported:
Potential cross-complex

ID: 318

Program Title: In Situ Detection of Organics, Demo Support

Summary Description:
The objective of this continuing demonstration related project is to fully evaluate and field test fiber-optic sensors (optrodes) for in-situ monitoring of contaminant species in ground water. As a part of this demonstration related project, a protocol for using in-situ fiber-optic sensors for vadose and aqueous-phase measurements will be developed. This will require the development of field-portable fiber-optic instrumentation. It will also require developing test procedures for in-situ measurements and testing the optrodes under real world conditions to determine their limitations. Successful sensors will be moved to site-directed applications or integrated demonstration projects.

Summary Purpose/Need:
The main purpose is to determine the limitations of the devices under actual field conditions and use this information to improve the sensors and instrumentation.

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: characterization
monitoring

Target Site: Savannah River

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
VOC in Non-Arid Soils ID

ID: 319

Program Title: Fiber Optic Sensor and Analysis for the Integrated Demonstration for Cleanup of Soils and Groundwater in Non-Arid Sites

Summary Description:
The Integrated Demonstration at the SRS has been chosen as the initial location for field demonstration of LLNL fiber sensor technology. Sensors and instrumentation that are significantly into, or through, the development stage will be evaluated as to their applicability to the SRS. Initial target compounds will be volatile organic solvents and fuels. The LLNL TCE sensor has established sensitivity at below drinking water standard and has been engineered for field testing. Consequently, it will be the focus of FY 92 and 93 activities at SRS. It is anticipated that a second generation TCE sensor will be ready for field testing by late FY 92. Three sensor placement modalities will be evaluated (1) screened vadose zone well implant, (2) direct well-water implant and (3) penetrometer placement.

Summary Purpose/Need:
Sensors and instrumentation that are significantly into, or through, the development stage will be evaluated as to their applicability to the SRS. Initial target compounds will be volatile organic compounds (solvents and fuels).

Summary Result/Endpoint/Deliverable:
The on-demand TCE sensor will be demonstrated.

BDAT: NA

Functional Areas: characterization
monitoring

Target Site: Savannah River

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
VOC in Non-Arid Soils ID

ID: 321

Program Title: TCE/PCE VEGETATION DEMONSTRATION

Summary Description:
The general objective of this task is to demonstrate two innovative technologies (tasks) with potential for application to the DOE-DP waste management program.

Task 1 is to demonstrate the utility of using vegetation to enhance a microbial community in surface soils capable of rapid degradation of TCE and PCE. This technology is applicable to a variety of hydrocarbon contaminants, when they are confined to shallow sediments. It has the advantages of being low cost, resulting in complete degradation on site and being aesthetically pleasing.

Task 2 is concerned with the demonstration of a large scale continuous flow fermenter (bioreactor) for the treatment of TCE and PCE. This technology has the advantages of creating on site degradation, terminal destruction, and being environmentally sound and cost effective. Cost effectiveness modeling has shown that this technology will save at least 40-60% over conventional air stripping/activated carbon adsorption. Additional savings and efficiencies will be realized when compared to air stripping by the degradation of less volatile compounds by the bioreactor.

Summary Purpose/Need:
The specific goal is to develop and implement an environmental project for demonstrating / evaluating the potential of 1) in situ bioreclamation for cleanup of shallow subsurface contamination and 2) bioreactor bioreclamation for cleanup of deep subsurface contamination from disposal of chlorinated hydrocarbons in unlined waste disposal facilities.

Summary Result/Endpoint/Deliverable:
The two technologies will be tested and evaluated.

BDAT: BIODG

Functional Areas: waste destruction & stabilization
alternative organic destruction - low concentration

4695

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
VOC in Non-Arid Soils ID

ID: 328

Program Title: Integrated Demonstration for Cleanup of Organics in Soils and at Non Arid Sites; Off Gas Treatment

Summary Description:
The scope of the project includes demonstration and assessment of the efficiency and cost effectiveness of several innovative destructive or hybrid off-gas treatment systems at a cost of approximately $150K per system. Classes of technologies to be demonstrated include catalytic, biological, electrochemical, electrical, and carbon regenerating systems. The technologies that will be tested during FY92 for Phase I are: steam regeneration of activated carbon, gas-phase bioreactor, membrane separation, high-energy corona, photocatalytic destruction, and thermal catalytic destruction.

Summary Purpose/Need:
Large quantities of hazardous chlorinated solvents at DOE facilities need to be treated in order to comply with existing regulations. The classes of treatment for remediation of chlorinated solvents include systems that solely capture contaminants, systems that destroy contaminants directly in the off-gas stream, and hybrid systems that combine capture with destruction. Existing remediation systems pass off-gas streams from an airstripper through activated carbon. Cost effective systems based on on-site destruction of contaminants are clearly preferable because they do not produce a hazardous remedial waste. These technologies used in conjunction with air stripping or vacuum extraction have the potential to reduce the cost and increase the effectiveness of future remediation at contaminated sites.

Summary Result/Endpoint/Deliverable:
The technologies will be tested and evaluated.

BDAT: CARBN INCIN BIODG CHOXD

Functional Areas: offgas technology
alternative organic destruction - low concentration

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 330

Program Title: In Situ Secondary Ion Mass Spectrometry (SIMS) Analysis: Development and Evaluation of a Transportable Ion Trap SIMS Instrument for the Direct Analysis of Low Volatile Organic Compounds

Summary Description:
This program will develop a laboratory-based, transportable instrument which combines new SIMS technology developed at the INEL with an ion trap mass spectrometer. This instrument will have the capability to analyze low- or non-volatile organic materials such as chelating agents, complexing agents and their metal complexes. It will be able to function on-site, require no sample preparation, produce no laboratory waste, and will be cost effective based on rapid analysis time, and moderate instrument cost. These attributes will facilitate activities such as definition of plume boundaries, and analysis of exhumed samples like rocks and waste containers.

Summary Purpose/Need:
U and Pu are difficult to detect because they have low alpha activity, and their only photon emission is weak X-rays; hence, analyses are time consuming and expensive. The detection of complexing and chelating agents may be a useful indication of the possible presence of U and Pu, with substantially reduced cost and effort compared to the detection of Pu itself. Newly-developed SIMS technology has been shown to be effective for the analysis of organophosphorus compounds adsorbed onto a variety of surfaces.

Summary Result/Endpoint/Deliverable:
If the results of these studies are promising, then an IT SIMS will be constructed and tested in the laboratory. If these tests are positive, a transportable IT SIMS will be constructed and tested. Deliverables will include technology status report on component design and testing and complete the requirements document for a field-portable unit.

BDAT: NA

Functional Areas: characterization
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
UST ID

ID: 331

Program Title: Biological Destruction of Tank Wastes

Summary Description:
In the absence of oxygen, many naturally-occurring bacteria have the ability to reduce nitrate to nitrogen gas. In this task existing biotechnology processes will be adapted for use to remediate nitrate salts presently buried or stored as waste within the Department of Energy complex. It is observed that microbes were capable of denitrification under conditions of salt concentrations up to 4 Molar (sodium plus potassium) with acetic and phosphoric acids as the only added nutrients. This observation was critical to the development of a cost effective bioprocess, and continuation of this effort.

Summary Purpose/Need:
The purpose of this project is to demonstrate the feasibility of a biological process for the remediation of selected nitrate wastes from the storage tanks at the Hanford site. Remediation includes both microbial reduction of nitrates to N2 (denitrification) and separation of the radionuclide/heavy metal constituents by a combination of precipitation and adsorption on the biomass (biosorption).

Biological nitrate reduction can be accomplished in closed-loop systems with little materials handling and at ambient temperature and pressure. If radionuclides are present, most will absorb on the bacteria and the volume can be reduced by ashing. Thus, the mixed nitrate/radionuclide waste can potentially be separated into a non-hazardous salt waste and a small volume of low-level radioactive waste.

Summary Result/Endpoint/Deliverable:
A project management plan (PMP) and a revised TTP including the detailed agreed to within the PMP will be prepared.

BDAT: BIODG

Functional Areas: chemical physical treatment
radionuclide removal
removal of problem constituents

Target Site: Cross Complex

Location site: ANL_E

Programs/Facilities Supported:
Originally, a demonstration of this technology was scheduled to be done at ANL on laboratory effluent streams. The Air Force is now pushing for a groundwater decontamination at an Air Force site.

ID: 334

Program Title: DECONTAMINATION OF PROCESS STREAMS/GROUNDWATER CONTAINING VOLATILE ORGANIC COMPOUNDS

Summary Description:
This joint DOE/USAF/ANL/Hoechst Celanese effort will develop and demonstrate an innovative solvent-extraction membrane process for recovering dilute (ppb) volatile organic compounds (VOCs) from water and air streams. The VOCs studied will include chlorocarbons and hydrocarbons specific to DOE and USAF waste minimization and remediation needs. The process uses two unit operations, membrane-assisted solvent extraction (MASX) and membrane-assisted distillation stripping (MADS). The MASX process extracts dilute VOCs from water using a natural oil solvent such as sunflower oil. The MADS process recovers the natural oil solvent and concentrates the VOCs for destruction or reuse. Argonne's early tasks in this program will concentrate on obtaining the thermodynamic, hydraulic, and mass transfer data for operating the MASX/MADS. Hoechst Celanese will develop the membrane-module prototypes for testing MASX and MADS. These prototype modules will be evaluated at Argonne and used in a field demonstration at Argonne to remove VOCs from a 1000 gal/day (~4000 L/day) contaminated waste water stream. Our goal is to demonstrate this MASX/MADS technology in the field and obtain operating data to commercialize large-scale membrane modules based on prototype module performance. Use of the technology for removing VOCs from process air streams will also be investigated.

Summary Purpose/Need:
Lower energy costs. Concentrates VOCs as they are removed from groundwater and process streams. Modular design allows sizing unit to the job--whether its changing feed throughput (modules set in parallel) or need for higher decontamination factors (modules put in series). Units can be transported from site to site as they are needed. The VOCs are removed from salts in the groundwater, eliminating the problem of ferric hydroxide fouling of the units (iron will remain in the reduced state).

Summary Result/Endpoint/Deliverable:
We are in the R&D stage. In FY-92 the thermodynamic viability of the process was shown. In FY 1993 a lab-scale demonstration will be completed with a field demonstration in FY 1994. Commercialization of the process will begin after the field demonstration in FY 94.

BDAT: RORGS

Functional Areas: chemical physical treatment
high efficiency separation
removal of problem constituents
decontamination

Target Site: Argonne National Laboratory East

Location site: Argonne National Laboratory East

Programs/Facilities Supported:
Argonne's Waste Management Operations, processing of plutonium-containing TRU waste solutions for Waste Management Operations at Argonne National Laboratory. This program supports the program titled "TRUEX Technology-Based Development", ADS No. CH-A-1061-00.

ID: 336

Program Title: Processing of New Brunswick Laboratory Plutonium Wastes

Summary Description:
Analytical residues solutions have been accumulating at the New Brunswick Laboratory and at Argonne National Laboratory. These residues contain approximately 120 grams plutonium plus other TRU elements in various acid concentrations. This program is designed to treat these wastes, converting the liquid to a nonTRU waste that can be disposed of. The recovered plutonium will be converted to metal and returned to DOE. This program will show the applicability of the TRUEX process for treating "real" wastes, and will demonstrate the applicability of the Generic TRUEX model in designing flowsheets.

Summary Purpose/Need:
There is currently no disposal method for these wastes. This program is designed to treat these wastes, converting the liquid to a nonTRU waste that can be disposed of. The recovered plutonium will be converted to metal and returned to DOE. There is a significant cost benefit to removing TRU components from the waste. If the TRU concentration can be reduced to less than 100 nCi/g, then disposal of the waste in deep underground repositories is not needed. Disposal can be accomplished as grout in shallow underground storage vaults. Demonstration of the TRUEX process on these waste solutions shows the applicability of this process for processing TRU wastes at Hanford, Los Alamos, Idaho, and Rocky Flats. TRUEX is the base technology for processing wastes in the underground storage tanks at Hanford, Washington.

Summary Result/Endpoint/Deliverable:
Endpoint of this program is the successful processing of all six batches of waste, and the return of the separated plutonium to the DOE defense complex. Demonstration of the TRUEX process on these waste solutions shows the applicability of this process for processing TRU wastes at Hanford, Los Alamos, Idaho, and Rocky Flats.

BDAT: LLEXT RMETL

Functional Areas: chemical physical treatment
high efficiency separation
removal of problem constituents
material recycle

Target Site: Argonne National Laboratory East

Location site: Argonne National Laboratory East

Programs/Facilities Supported:
Argonne's Waste Management Operations, Building 306

ID: 337

Program Title: Preparation of a Preliminary Waste Treatment Plan and Installation of a Filtration System for nonTRU Mixed Waste

Summary Description:
Demonstrate the treatment of mixed wastes that contain both toxic/hazardous metals and radioactive components. Pretreatment includes precipitation of RCRA metals, thereby generating a filtrate that contains metal concentrations below levels specified by RCRA. The amount of RCRA concentrate in the evaporator bottoms will be reduced.

Summary Purpose/Need:
At this time, Argonne does not have any method approved and permitted for processing wastes containing RCRA-metals. This process will provide that capability. The chemistry and equipment being incorporated into this treatment facility are described in the literature, but what we are doing is putting the system together to treat a variety of waste streams. This project directly supports Waste Management Operations, Argonne National Laboratory.

Summary Result/Endpoint/Deliverable:
Both the pretreatment process and the filtration equipment setup are currently in the final design stages. Some of the equipment for the filter skid has been purchased. A draft of a preliminary treatment plan will be prepared, the design of a filtration system that can remove solids from a variety of mixed-waste slurries will be completed, and a feasibility study will begin. The current schedule is to have the filter skid installed and operable in Building 306 in 1993. The design of the pretreatment facility was completed by April 1993. These systems will have been designed specifically for treating nonTRU mixed wastes. A treatability study will begin in 1993. If the technology is demonstrated, ANL may ask to permit this process.

BDAT: PRECP

Functional Areas: chemical physical treatment
removal of problem constituents
flocculation/precipitation

Target Site: Idaho

Location site: Idaho

Programs/Facilities Supported:
WEDF

ID: 339

Program Title: Elemental mercury amalgamation

Summary Description:
Bench scale tests will provide parameters to develop a full-scale amalgamation process for treating radioactively contaminated mercury. Various parameters relating to the amalgamation process have been tested using commercial grade mercury. In second test actual waste was treated in order to confirm the utility of techniques developed in the first series of tests.

Summary Purpose/Need:
Amalgamation is the RCRA specified treatment for mercury. The processing parameters needed to be developed.

Summary Result/Endpoint/Deliverable:
Obtain DOE-ID approval to commence operations per the Non-Incinerable Mixed Waste Treatment Plan.

BDAT: AMLGM

Functional Areas: chemical physical treatment
final form (mercury stabilization)

Target Site: Idaho

Location site: Idaho

Programs/Facilities Supported:
WEDF

ID: 340

Program Title: Treatment of mixed heavy metal waste

Summary Description:
A two step ion exchange (cation and anion) process has been demonstrated at the bench scale. A variety of process parameters such as ionic strength, relative ionic concentrations, temperatures, etc. will be assessed in the pilot scale demonstrations.

Summary Purpose/Need:
There is a need to remove heavy metals from a variety of aqueous streams.

Summary Result/Endpoint/Deliverable:
The ion exchange full scale pilot tests will be complete 7/93 and treatment operations are expected to begin in 8/93.

BDAT: RMETL

Functional Areas: chemical physical treatment
removal of problem constituents
ion exchange

Target Site: Idaho

Location site: Idaho

Programs/Facilities Supported:
WEDF

ID: 341

Program Title: Lead macroencapsulation (Support of the Radioactive Waste Management Complex (RWMC))

Summary Description:
The RCRA requirements for the disposal of lead specify macro-encapsulation in a contact encapsulant. This development effort is directed toward the demonstration of the effectiveness of a polymeric coating as the encapsulant.

Summary Purpose/Need:
The need is to provide a waste form that is consistent with the macro- encapsulation requirements for lead.

Summary Result/Endpoint/Deliverable:
Submit a report and recommendations based on completed tests to DOE, EPA, and DOR.

BDAT: MACRO

Functional Areas: final form
lead treatment/recycle
final form-grout or macro-encapsulation

Target Site: Idaho

Location site: Idaho

Programs/Facilities Supported:
WEDF

ID: 342

Program Title: Sulfur polymer cement immobilization

Summary Description:
Sulfur polymer cement is a thermoplastic that, as a construction cement, has demonstrated its ability to survive for years in acids and salts that destroy or severely damage hydraulic cements. This effort has focused on the solidification and stabilization of radioactive wastes for treatment of incinerator ash which contains heavy metals that have been oxidized and readily combine with sulfur polymer cement to form metal sulfides and sulfates.

Summary Purpose/Need:
There will be a need to create an LDR compatible waste form for low level ash from the incinerator.

Summary Result/Endpoint/Deliverable:
Develop a sulfur polymer cement demonstration work plan (6/1/91)

BDAT: STABL

Functional Areas: final form
final form-grout or macro-encapsulation

4695

Target Site: Idaho

Location site: Idaho

Programs/Facilities Supported:
RWMC

ID: 343

Program Title: Iron enriched basalt (IEB) waste forms and processing

Summary Description:
The class of high temperature ferro-alumina-silicate glass/ceramic materials referred to as IEB is being investigated as a means of long term immobilization of alpha and toxic metal contaminated MLLW. The contaminated soils and wastes at INEL naturally yield a form of IEB when melted. Bench scale crucible and high temperature melter tests are being performed to provide additional data needed to determine and optimize final waste form performance and processing conditions and capability over the range of potential input waste conditions.

Summary Purpose/Need:
The alpha and toxic metal contaminated MLLW at INEL will require an immobilization waste form which will pas TCLP requirements.

Summary Result/Endpoint/Deliverable:
The results of these studies will be IEB material performance data, comparisons to other candidate waste forms, melter processing conditions/requirements, controlling parameters as well as recommendations for process selection and design.

BDAT: STABL

Functional Areas: final form
final form glass

Target Site: Idaho

Location site: Idaho

Programs/Facilities Supported:
ICPP

ID: 344

Program Title: Immobilization of calcine HLW

Summary Description:
Processes are being evaluated in which the calcine is immobilized in a glass ceramic waste form. This waste form is more dense than borosilicate glass and is capable of higher waste loadings, reducing the volume produced for final disposal. The process parameters and formulations are being optimized in these studies.

Summary Purpose/Need:
The calcined HLW does not meet LDR criteria and must be immobilized for disposal in a licensed facility.

Summary Result/Endpoint/Deliverable:
The preliminary fluorinel-sodium glass-ceramic waste form will be complete. Preliminary reports concerning the phosphate additive for the flourinel-sodium waste form and the waste form development for zirconia calcine will be complete.

BDAT: HLVIT

Functional Areas: final form
final form glass
final form ceramic

Target Site: Idaho

Location site: Idaho

Programs/Facilities Supported:
ICPP

ID: 345

Program Title: Treatment of sodium-bearing HLLW

Summary Description:
A number of methods are being examined for processing sodium-bearing radioactive liquid waste. Among these are calcination with additives, direct immobilization, freeze crystallization, solvent extraction, ion exchange, and others.

Summary Purpose/Need:
The sodium-bearing radioactive liquid waste does not meet LDR criteria and must be treated.

Summary Result/Endpoint/Deliverable:
At least four waste processing methods will be chosen for further investigation.

BDAT: STABL RMETL HLVIT

Functional Areas: final form
removal of problem constituents
treatment
chemical physical treatment

4695

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
LETF

ID: 346

Program Title: Reverse osmosis studies

Summary Description:
The range of concentrations which can be effectively treated using this technique are being investigated. This will be one of the first processes in the chain and will be designed to reduce the concentration of species reaching the ion exchange columns. The ion exchange resins will have concentration ranges and pH ranges over which they will operate the most efficiently. It will be necessary for the reverse osmosis unit to provide concentrations and pH's within this range. This will also extend the life of the columns.

Summary Purpose/Need:
The LETF will be a multistage treatment facility. In order to extend the life or times between recharging of the latter processing stages, it is necessary to remove high concentration contaminants.

Summary Result/Endpoint/Deliverable:
The results of these tests will be a definition of the operating envelope for the reverse osmosis unit.

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
LETF

ID: 347

Program Title: UV photolysis

Summary Description:
UV photolysis is being studied as a means to destroy organics in the in-coming aqueous streams that the LETF will treat. This treatment method is more efficient and cheaper than ozonolysis. The range of concentrations and treatment rates are being determined. This is another of the pretreatment technologies in the process stream.

Summary Purpose/Need:
This will be the only part of the treatment train which will deal with organic contaminants.

Summary Result/Endpoint/Deliverable:
The results of these tests will be a definition of the operating envelope for the UV photolysis unit.

BDAT: WTRRX

Functional Areas: waste destruction & stabilization
primary organic destruction - high concentration

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
Tank waste treatment evaporator final aqueous treatment

ID: 348

Program Title: Ion Exchange

Summary Description:
Ion exchange will be the final purification step in the aqueous treatment chain. This step will reduce the hazardous metal and radionuclide concentrations below the drinking water standard requirements. The tank waste treatment evaporator is expected to produce streams of varying concentrations of varying constituents. It will be necessary to understand the acceptable operating ranges for the resin when processing these materials.

Summary Purpose/Need:
This is the final stage in the treatment process. It has to provide the metals and radionuclide removal efficiencies that will bring the effluent into compliance with applicable standards.

Summary Result/Endpoint/Deliverable:
The results of these tests will be a definition of the operating envelope for the ion exchange process.

BDAT: RMETL

Functional Areas: chemical physical treatment
removal of problem constituents
ion exchange
radionuclide removal

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
Savannah River Site M Area Electroplating Sludge Treatability Study

ID: 349

Program Title: Immobilization studies

Summary Description:
Grout and vitrification are currently being examined as the best means of immobilization. The bench testing will deliver waste forms that pass TCLP and will produce cost data to allow a choice between the two methods. Grout and borosilicate forms have already been demonstrated to pass the TCLP.

Summary Purpose/Need:
A treatment method is needed to provide an acceptable waste form for disposal in vaults. The method will be one that will allow a commercial vendor to bring temporary treatment facilities on site, treat the inventory of material, and remove the treatment facilities when all of the material has been immobilized.

Summary Result/Endpoint/Deliverable:
The result of this study will be a waste form recommendation choosing between grout and vitrification with demonstrations of the performance of the chosen form.

BDAT: HLVIT STABL

Functional Areas: final form
final form glass
final form-grout or macro-encapsulation

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
MLLW Laboratory Drain Storage Tank Treatment Capacity Development.

ID: 350

Program Title: Electron beam treatment of MLLW

Summary Description:
Electron beams are being evaluated as a treatment technology which destroys the organic components (the benzene and benzene derivatives) of the mixture in the tank. The method has shown the ability to destroy organics up to the solubility limit of the organics in water, may be applicable to a wide variety of DOE waste streams, and is cheaper than ozonolysis. The technology will been demonstrated at the pilot plant level.

Summary Purpose/Need:
Laboratory MLLW liquids containing benzene, benzene derivatives and natural uranium are held in a laboratory drain storage tank.

Summary Result/Endpoint/Deliverable:
A final report detailing the performance in the 4000 gal treatment test will be delivered in fall of 1993. These data will be the basis for the design of a treatment facility.

BDAT: WTRRX

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration

4695

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
CIF

ID: 351

Program Title: Waste form evaluation

Summary Description:
A development program is being carried out to stabilize CIF blowdown solids in a waste form that will pass TCLP. Vitrification, thermoplastic, and cement are being evaluated as immobilization media.

Summary Purpose/Need:
The CIF blowdown ash will contain radioactive components in association with hazardous metals and will be a mixed waste. The ash will need to be stabilized in a form that will pass TCLP requirements.

Summary Result/Endpoint/Deliverable:
Bench scale testing, which is scheduled to be completed by 9/93, is expected to provide performance data upon which to base decisions on which form or forms to take to the pilot phase of development.

BDAT: HLVIT STABL MACRO

Functional Areas: final form
final form glass
final form-grout or macro-encapsulation

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
CIF

ID: 352

Program Title: Off-gas treatment studies

Summary Description:
An off-gas pilot facility (1/10 scale) is almost complete. The project will be ready to operate eight months after Part II project authorization.

Summary Purpose/Need:
The design and operation of the CIF off-gas treatment pilot scale system will provide data on off-gas treatment performance as well as help to predict CIF reliability and maintenance (RAM). It will also provide additional support during the operation of the CIF.

Summary Result/Endpoint/Deliverable:
This facility will generate data concerning particle and HCl removal efficiencies, RAM considerations, process optimization, and support CIF operation through pilot studies.

BDAT: INCIN

Functional Areas: offgas technology

4695

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
CIF

ID: 353

Program Title: Hazardous metals transport in incinerators

Summary Description:
Feed material for the CIF will contain hazardous metals as well as hazardous organics. The hazardous organics will be destroyed while the fate of the metals must be determined. A series of tests to determine the transport of the metals through the process chain is in progress in a pilot scale rotary kiln incinerator. Metal doped samples have been incinerated, and sample characterization is in progress to determine the metal concentrations at various points in the system.

Summary Purpose/Need:
Since the feed material from the CIF will contain hazardous metals, it is necessary to understand the metals travel pathways through the system during operation.

Summary Result/Endpoint/Deliverable:
The data generated in these tests will be used to determine hazardous metals transport in the process. The data will help in the development of secondary waste stabilization processes to contain the metals.

BDAT: INCIN RMETL

Functional Areas: offgas technology
system analysis
decision support

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
CIF

ID: 354

Program Title: Rotary kiln seal tests

Summary Description:
Several new rotary kiln seal designs will be tested (beginning 10/93) in a 1/4 scale pilot facility. Successful tests will validate the seal containment and operating life.

Summary Purpose/Need:
Operation of a mixed waste, rotary kiln incinerator requires seals that can control air in-leakage and contain positive pressure excursions.

Summary Result/Endpoint/Deliverable:
A better seal will enhance the system safety as well as the performance and maintainability.

BDAT: INCIN

Functional Areas: waste destruction & stabilization
thermal treatment unit - high residue

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
CIF

ID: 355

Program Title: CIF related waste minimization activities

Summary Description:
Included in the development effort supporting the CIF is a waste minimization activity. This activity is addressing the replacement of PVC in on-going operations that generate larger quantities of blowdown in the off-gas treatment.

Summary Purpose/Need:
The incineration of materials with a high chlorine content, e.g. PVC, produces a large quantity of HCl in the blowdown which must be removed in the secondary treatment system. High quantities of chlorine containing materials will produce high quantities of secondary waste and will be more difficult to stabilize.

Summary Result/Endpoint/Deliverable:
When these wastes become feed for the CIF, they will produce less secondary waste than high chlorine bearing materials which will decrease the volume of blowdown solids.

BDAT: NA

Functional Areas: waste minimization
thermal treatment unit - high residue

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
CIF

ID: 356

Program Title: Waste form for CIF Ash

Summary Description:
Specific formulations for a wet ash ashcrete process are being developed to be compatible with CIF ash.

Summary Purpose/Need:
The ash from the CIF will contain hazardous metals and radioactive constituents and therefore will be a mixed waste. The waste form must immobilize the RCRA and radioactive constituents. In addition the waste form must pass compressibility tests and TCLP requirements for vault storage.

Summary Result/Endpoint/Deliverable:
The result of these tests will be the development of an ashcrete formulation which will produce a waste form which will satisfy the above requirements.

BDAT: STABL

Functional Areas: final form
final form-grout or macro-encapsulation

4695

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
HW/MW TF

ID: 357

Program Title: Silver saddle treatment

Summary Description:
Silver saddles (a ceramic substrate coated with silver nitrate) have been used to scavenge radioactive iodine from gas streams. The spent saddles are a disposal problem since the silver nitrate is not totally reacted to insoluble silver iodide and the residual silver ion is soluble. HBr treatment of the saddles is being studied as a means of immobilizing the residual silver ion as AgBr which is insoluble.

Summary Purpose/Need:
Silver is a RCRA regulated metal. The presence of radioactive iodine in addition to the silver places the waste in the mixed waste category. This necessitates putting the material in a waste form which passes TCLP requirements.

Summary Result/Endpoint/Deliverable:
If the tests are successful, they will demonstrate that the soluble silver has been converted to an insoluble form. In this form it will be suitable for disposal in a long lived isotope facility.

BDAT: STABL

Functional Areas: chemical physical treatment
final form

327

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
HW/MW TF

ID: 358

Program Title: Lead Macroencapsulation

Summary Description:
A simple process for encapsulating lead cylinders in epoxy, contained in a metal shell, has been developed and is being evaluated. The encapsulation is resistant to radiation, will withstand shock and meets EPA requirements.

Summary Purpose/Need:
Macroencapsulation is required for contaminated lead.

Summary Result/Endpoint/Deliverable:
The method will provide an easily handled and disposable waste form which satisfies the relevant requirements.

BDAT: MACRO

Functional Areas: final form
final form-grout or macro-encapsulation
lead treatment/recycle

4695

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
HW/MW TF

ID: 359

Program Title: Destruction of HAZ/MIXED/TRU waste - removing plutonium oxide

Summary Description:
A method for removing plutonium oxide from surfaces of a wide variety of materials has been developed. Solutions of Ag+2 are generated in the presence of the plutonium contamination. The silver ion oxidizes the plutonium to a soluble form. After which it dissolves away from the surface. The process has been tested at the bench scale.

Summary Purpose/Need:
There is a need to reduce the volume of plutonium contaminated waste.

Summary Result/Endpoint/Deliverable:
This process is ready to be deployed in support of the HW/MWTF.

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal

329

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
HW/MW TF

ID: 360

Program Title: Destruction of HAZ/MIXED/TRU waste - organic material oxidation process

Summary Description:
A solution based, organic material oxidation process has been developed. The process involves the use of nitric and phosphoric acid in a closed digestion system. The process has demonstrated a 99% destruction efficiency for organics such as plastic. Inorganics remain in solution or precipitate as solids and can be separated from the process solutions. This process can also remove PuO2 from the surface of noncombustible solids. This is heavily supported in the literature and is more efficient than HNO3-HF dissolution for PuO2.

Summary Purpose/Need:
There is a large volume of radioactive or TRU contaminated organic material, particularly plastics. A reduction of the volume of the material would be beneficial.

Summary Result/Endpoint/Deliverable:
The current studies are directed toward the generation of chemical rate data and pilot design information. Successful development should reduce SRS dependency on shipments to the WIPP.

BDAT: CHOXD INCIN

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration

Target Site: Rocky Flats

Location site: PNL

Programs/Facilities Supported:
RFP LDR Compliance Program

ID: 365

Program Title: Mediated Electrolytic Oxidation (MEO) Alternative (PNL)

Summary Description:
The Mediated Electrolytic Oxidation (MEO) process is one part of the Incineration Alternatives (IA) project. IA is investigating individual technologies for the destruction of mixed combustible waste to allow selection of the most promising incineration alternative technologies for cold pilot scale system demonstration. This activity uses DOE laboratories and commercial firms to evaluate possible technologies. FY93 activities are focused on the largest volume categories of combustible waste: cutting oils and solid combustibles. The laboratory or subcontractor will define the optimum operating parameters and rates of destruction for each combustible waste stream which apply to MEO. The laboratory or subcontractor will provide a formal report detailing the results of the experimental work, including a basic conceptual design for a cold demonstration of MEO. The conceptual design will include material/energy balances, and identification of secondary waste streams and their treatment requirements.

The MEO process uses an electrochemical reactor to oxidize a mediator (e.g. silver, Ag) in an electrolyte (e.g. nitric acid, HNO3). The oxidized mediator in turn oxidizes and destroys the organics in the electrolyte. Also the radioactive components of the mixed waste are rendered soluble by the mediator and can be removed from the solution with an ion exchange column for recovery or concentrated for burial.

Summary Purpose/Need:
The goals of this activity are to identify, develop, test and demonstrate the MEO process as an alternative to incineration for the treatment of RFP low-level mixed combustible waste and for waste stream treatment across the complex. This activity is intended to meet the requirements of the Comprehensive Treatment and Management Plan (CTMP).

Summary Result/Endpoint/Deliverable:
- FY 93 development summary report - 9/93
- Data sufficient to allow comparison with other candidate technologies and down-select of the preferred technology.

BDAT: CHOXD INCIN

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration
primary organic destruction - low concentration
primary organic destruction - high concentration

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 369

Program Title: SUPERCRITICAL WATER OXIDATION (SCWO) DEMONSTRATION PROGRAM

Summary Description:
The scope of this project includes planning, coordination, and development activities which will lead to the demonstration of a supercritical water oxidation (SCWO) treatment pilot plant for radioactive waste. The SCWO program will incorporate two elements to facilitate the program objective; 1) Super Critical Water Oxidation Research and Development (SCWO R&D) which will provide technical "needs" to support the SCWOD and reduce duplicated efforts among different agencies, and 2) Supercritical Water Oxidation Demonstration (SCWOD).

Summary Purpose/Need:
Mixed wastes that include hazardous organic components are prevalent throughout the DOE complex. They present a serious problem in that treatment and disposal options for mixed wastes are extremely narrow. Rocky Flats Plant (RFP) has a particular problem with mixed waste sludges that are currently not stabilized or fully characterized.

SCWO presents a viable option to incineration for mixed wastes, and it shows potential for contained treatment that is not linked to effluent release. SCWO effluent can be recirculated and measured prior to release without affecting the treatment process. For sludges, preliminary information indicates that SCWO could be more economical than incineration for large throughput.

Summary Result/Endpoint/Deliverable:
The deliverables include a Project Management Plan, Program Strategic Plan (draft), and Phase I NEPA documentation. Specific progress to date has included developing a candidate waste list that reflects the waste streams in the DOE complex that have a high probability for successful treatment with SCWO. In addition, surrogate waste tests have been initiated on MODEC's 30 gpd SCWO unit to gain preliminary data into the viability of SCWO technology to treat mixed waste.

BDAT: CHOXD INCIN

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration

4695

Target Site: Idaho

Location site: Idaho

Programs/Facilities Supported:
Efficient Separations ID

ID: 370

Program Title: Pyrochemical Process for ICPP HLW Calcine

Summary Description:
This work plan describes a two-phase research and development program, estimated to require 3 years, to establish feasibility for a pyrochemical process for Idaho Chemical Processing Plant (ICPP) high-level waste (HLW) calcine. Pyrochemical treatment consists of high-temperature processing for removal of inert materials and separation of actinides and fission products in a molten metal/salt environment. This conceptual process has the potential to significantly reduce the amount of HLW which would require disposal in a federal repository by up to 30 fold. The two phases of this program are 1) Technical Feasibility Analysis and Initial Proof of Principle Experimental Development and 2) Non-Radioactive Small-Scale Process Feasibility Testing

Summary Purpose/Need:
Greater than 80 wt% of the ICPP HLW calcine material is non-radioactive and non-hazardous. If the non-radioactive material is separated from the radioactive and hazardous components, cost avoidance to the DOE in disposal charges at a geologic repository would be very significant. The principal incentive for partitioning actinides from the fission products and the remaining bulk waste is the cost of disposal of the long-lived radioisotopes. By reducing the volume of this waste, potentially billions of dollars can be saved in disposal costs. Furthermore, concentrating the actinide and fission products as metal alloys opens numerous new opportunities for immobilizing, packaging, and storing and/or disposing the waste.

Summary Result/Endpoint/Deliverable:
If technology feasibility will be successfully demonstrated, a potential profound cost savings in reduced numbers of HLW canisters sent to a federal repository can be realized by the DOE.

BDAT: HLVIT

Functional Areas: chemical physical treatment
removal of problem constituents
waste destruction & stabilization
radionuclide removal

333

Target Site: Cross Complex

Location site: Sandia National Laboratories (Albq)

Programs/Facilities Supported:
UST ID

ID: 374

Program Title: Efficient Separation Processes Integrated Program - Aqueous biphasic systems

Summary Description:
Aqueous biphasic systems will be developed to permit the extraction and recovery of dissolved inorganic ions from high ionic strength acidic or basic solutions. Systems will be generated by the addition of polyethylene glycols to the aqueous solutions to form biphasic systems. Objectives are to develop systems to remove Tc, I, and Se from radioactive wastes.

Summary Purpose/Need:
The program is to develop improved aqueous biphasic systems to selectively remove Tc, I, and Se from radioactive wastes.

Summary Result/Endpoint/Deliverable:
Develop improved aqueous biphasic systems. An annual report will include results on all studies conducted during FY 93, including results to date on achievable decontamination factors, optimized parameters, etc.

BDAT: LLEXT

Functional Areas: chemical physical treatment
radionuclide removal

4695

Target Site: Cross Complex

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
UST ID, and sludge problems/technologies/plans at ORNL, SRL, and RL.

ID: 375

Program Title: Efficient Separation Processes Integrated Program - Sludge Technology Assessment

Summary Description:
The objectives of this work are 1) to assess the state of radioactive sludge problems and treatment capabilities within the DOE complex; 2) identify potential treatment capabilities and specialists in industry and academia; and 3) identify areas where R&D is needed. Activities include: Assess sludge problems/technologies/plans at ORNL, SRL, and RL. Assess sludge capabilities in industry, academia, and remaining national laboratories. Compile bibliography of existing literature, data, databases, etc.

Summary Purpose/Need:
Sludge characterization and technology process data and experience exists across the complex and in industry and academia, but has not been consolidated and integrated. This is a high priority to ensure the best use of R&D funds.

Summary Result/Endpoint/Deliverable:
Report on problems/capabilities/previous work. Deliver final report

BDAT: NA

Functional Areas: system analysis
decision support

335

Target Site: Cross Complex

Location site: Argonne National Laboratory East

Programs/Facilities Supported:
UST ID

ID: 376

Program Title: Efficient Separation Processes Integrated Program - Advanced solvent extraction/recovery processes

Summary Description:
The purpose of this task is to develop new advanced solvent extraction/recovery processes in support of the clean option strategy. The new separation scheme comprises a series of novel processes designed to extract and recover Th, U, TRUs (NP, Pu, Am, Cm), Sr-90, and Tc-99 from dissolved sludge waste in Hanford storage tanks. The major objective is to reduce the complexity and cost of the chemical pretreatment of dissolved sludge and to achieve decontamination factors sufficient to produce raffinates and effluent streams that will meet specifications of Class A LLW.

Summary Purpose/Need:
The major objective is to develop suitable baseline, reduce the complexity and cost of the chemical pretreatment of dissolved sludge and to achieve decontamination factors sufficient to produce raffinates and effluent streams that will meet specifications of Class A LLW. Activities include: Prepare synthetic dissolved sludge waste. Batch test combined SEREX-PUREX on synthetic sludge. Develop and test Sr, Np, Pu/Ba separation.

Summary Result/Endpoint/Deliverable:
Develop new advanced solvent extraction/recovery processes. A report will include results on all studies conducted during FY93.

BDAT: LLEXT

Functional Areas: chemical physical treatment
radionuclide removal

4695

Target Site: Hanford

Location site:

Programs/Facilities Supported:
UST ID

ID: 377

Program Title: Efficient Separations Processes Integrated Program - Comprehensive Sludge/Supernate R&D

Summary Description:
This task will focus on performing experimental and modeling R&D in support of comprehensive sludge/supernate processing flowsheet development being conducted for the Underground Storage Tank Integrated Demonstration. Primary emphasis will be on Hanford tank waste. A workplan is being developed to establish milestones, tasks, deliverables.

Summary Purpose/Need:
Perform experimental and modeling R&D in support of comprehensive sludge/supernate processing flowsheet.

Summary Result/Endpoint/Deliverable:
Prepare and issue workplan for FY93 activities.

BDAT: NA

Functional Areas: system analysis
decision support

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
UST ID

ID: 378

Program Title: Efficient Separation Processes Integrated Program - Technology Evaluation: Determine incentives and Data Needs for Demonstrating Pretreatment Technologies (formerly, Advanced Chemical Separations)

Summary Description:
The objective of this work is to determine and compare incentives for including pretreatment technologies in an integrated tank waste remediation system. the incentive will be determined in terms of the overall cost and operating schedule of the integrated system, and will consider costs of retrieval and disposal. Technologies will be linked into an integrated system by modeling process flowsheet mass balances in a common modeling format.

Summary Purpose/Need:
The objective of this work is to determine and compare incentives for including pretreatment technologies in an integrated tank waste remediation system.

Summary Result/Endpoint/Deliverable:
Prepare and deliver workplan to include technologies for study, timelines, etc.

BDAT: NA

Functional Areas: system analysis
decision support

4695

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
UST ID

ID: 379

Program Title: Efficient Separation Processes Integrated Program - INSITU MAGNETICALLY-ASSISTED CHEMICAL SEPARATION

Summary Description:
The objectives of this work are to develop and evaluate the use of magnetic beads coated with extractants as a delivery mechanism to extract TRUs from DOE wastes. The process uses magnetic beads coated with solvents for selective separation of TRU (e.g. TRUEX). The beads are formed from iron or other magnetic material coated with polystyrene-divinylbenzene copolymer. Organic solvents can be adsorbed onto the polymeric surface by contacting the beads with a solution of the solvent in a volatile diluent and removing the diluent by evaporation. After the TRUs are extracted from an aqueous phase onto the magnetic beads, these beads can be separated from the aqueous solution via magnetic techniques and regenerated by stripping techniques.

Summary Purpose/Need:
The objectives of this work are to develop and evaluate the use of magnetic beads coated with extractants as a delivery mechanism to extract TRUs from DOE wastes.

Summary Result/Endpoint/Deliverable:
Develop and evaluate the use of magnetic beads coated with extractants as a delivery mechanism to extract TRUs from DOE wastes. An annual report will include results on all studies conducted during FY93, with joint authorship from Bradtec, the industrial partner.

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
UST ID

ID: 380

Program Title: Efficient Separation Processes Integrated Program - Development of High Capacity Selective Fixed Sequestering Agents (Solid Sorbents for Selective Separation of Radioactive Nuclides)

Summary Description:
The purpose of this work is to develop high-capacity, selective solid extractants for cesium, strontium, chromium, and noble metals from nuclear wastes. This is a collaborative effort with industry.

Summary Purpose/Need:
The purpose of this work is to develop high-capacity, selective solid extractants for cesium, strontium, chromium, and noble metals from nuclear wastes. If the radionuclides could be totally separated from Hanford HLW, the number of canisters could be dramatically reduced to a few hundred, saving on the order of $30-35 billion. Additionally, unless advanced SWFTP are implemented, the number of canisters will exceed the defense -allocated capacity of the first geological repository and two additional HWVPs would be required if the Hanford waste is to be processed within 30 years.

Summary Result/Endpoint/Deliverable:
Two industrial contracts were awarded in FY92 via an RFP process. The industrial work with nonradioactive nuclides constitutes Phase I. Phase II testing of the industrial technology with radioactive nuclides will be conducted at PNL with industry participation. Phase III will involve scale-up and pilot testing. Deliverables include:
Reports on Phase II project plan and recommendation (Allied/Texas A&M, and 3M/IBC), Final reports on Phase I work (Allied/Texas A&M, and 3M/IBC), Reports on Phase III project plan and recommendation (Allied/Texas A&M, and 3M/IBC), Final reports on Phase II PNL testing (Allied/Texas A&M, and 3M/IBC).

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal
removal of problem constituents

4695

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 381

Program Title: Efficient Separation Processes Integrated Program - Calcine Residue Leaching: Volume Reduction for High Level Waste Sludges

Summary Description:
Addresses the need to reduce HLW volume via calcination, which destroys organics and nitrates. Leaching of the calcine residue will further reduce volume. Calcining Hanford tank wastes is the only nonaqueous alternative proposed for the updated Tank Waste Remediation System (TWRS) strategy. New calcination methods being tested as part of the USTID are expected to be able to handle the high sodium Hanford wastes. The thrust of this work is to develop methods for removal of nonradioactive constituents from residues produced by calcining and aqueous leaching. Calcine residue volume, which would directly control high level waste volume, could be significantly reduced by dissolving major nonradioactive components. The chemical state of the calcine and leach residuals will be established, and responses to additional thermal and chemical treatment will be established. This knowledge will be used to identify methods to selectively leach the nonradioactive species or to dissolve broad ranges of constituents for separation. Extraction processes applied to calcine residues are expected to be more efficient than similar processes on raw tank waste, because of previous elimination of sodium, aluminum and nitrates. Extraction work will focus on gross acidic dissolution and electrochemical separation. Activities include: Select reference process for calcine leach/dissolution for one waste type. Complete leaching tests on 5 waste types with the reference process.

Summary Purpose/Need:
The program addresses the need to reduce HLW volume via calcination, which destroys organics and nitrates. Leaching of the calcine residue will further reduce volume. Calcining Hanford tank wastes is the only nonaqueous alternative proposed for the updated Tank Waste Remediation System (TWRS) strategy. Calcine residue volume, which would directly control high level waste volume, could be significantly reduced by dissolving major nonradioactive components. If the radionuclides could be totally separated from Hanford HLW, the number of canisters could be dramatically reduced to a few hundred, saving on the order of $30-35 billion. Additionally, unless advanced Separations and Waste-Form Technologies and Processes (SWFTP) are implemented, the number of canisters will exceed the defense -allocated capacity of the first geological repository and two additional HWVPs would be required if the Hanford waste is to be processed within 30 years.

Summary Result/Endpoint/Deliverable:
Report will include results on all studies conducted during FY93, including reference process selected and plans for leach testing, results of leaching study of 5 waste types with the reference process.

BDAT: RMETL

Functional Areas: chemical physical treatment
removal of problem constituents
high efficiency separation
radionuclide removal

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 382

Program Title: ESPIP Selective Leaching of tank sludges by the ACT*DE*CON Process

Summary Description:
This work will assess the ability of Bradtec's proprietary ACT*DE*CONSM process to treat and recover various radionuclides from waste sludge. Lab-scale tests with simulated wastes will be performed at Bradtec and will be repeated at PNL with actual waste sludge.

Summary Purpose/Need:
Direct extraction from sludge slurry waste would reduce process and secondary waste and would simplify treatment.

Summary Result/Endpoint/Deliverable:
Develop and submit workplan. Report will include results on all studies conducted during FY93, with joint authorship from Bradtec, the industrial partner.

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal

Target Site: Cross Complex

Location site: Lawrence Livermore National Laboratory

Programs/Facilities Supported:
UST ID

ID: 383

Program Title: Efficient Separation Processes Integrated Program - Derivatives of Natural Complexing Agents for Removal of Pu From Waste Waters

Summary Description:
The activities in this project will be to search for sequestering agents for plutonium that have their origin in naturally occuring materials. Specifically, the project will 1) determine the stability constants of desferioxamine B (DFO with Pu(IV); 2) determine the speciation of the metal-ligand complex as a function of pH in order to determine interference of other metal ions with Pu(IV) complexation; 3) determine the stability constants of the DFO derivative with Pu(IV)over a range of ionic strengths up to 25; 4) attach appropriate ligands to solid-supported molecules and/or lipophilic molecules on prototype waste streams or actual Hanford tank solutions.

Summary Purpose/Need:
Search for sequestering agents for plutonium that have their origin in naturally occuring materials.

Summary Result/Endpoint/Deliverable:
Report will include results on all studies conducted during FY93. Include results to date on formation constants, description of DFO and DFO derivative syntheses, dependencies of formation constants on pH and ionic strength and in presence of Na, Ca2+, NO3- , Al3+, & Fe3+.

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
UST ID

ID: 384

Program Title: Efficient Separation Processes Integrated Program - Innovative Chemical Separation: Development and Testing of New Chemical Separations and Treatment Methods for Nuclear Waste Disposal

Summary Description:
The overall scope of this work is to identify, develop, and test new solid-based chemical separations/treatment options that could result in major cost reductions and environmental benefits in the treatment of radioactive and hazardous wastes across the DOE complex. Initial efforts will be directed at recovery and concentration of Cs, Sr and TRUs. New options to separate cesium, strontium and transuranics from basic and acidified HLW will be identified, developed and tested. This project will act as a test bed and integrator for DOE and industrial work on solid-based and other advanced sequestering agents. Specific problems at Hanford will be targeted.

This program will rely heavily on technology transfer from outside organizations such as Los Alamos National Laboratory, academics, industrial collaboration (Development of High-Capacity Selective Fixed Sequestering Agents, TTP RL321701), ligands material marketed by EIChroM Industries, Inc, and IBM Advanced Technologies. In addition, the efforts will be guided by the strategy developed for the OTD Efficient Separations and Processing Integrated Program (ESPIP).

Summary Purpose/Need:
A compelling economic and environmental need has been identified for the capability to separate high-level wastes (HLW) into separated high- (SHLW) and low-level (SLLW) fractions so as to minimize the quantity of SHLW that must be stored in a deep geologic repository and at the same time to minimize the environmental hazards of SLLW that will be stored at or near the earth's surface. This technology is a response to develop separations technologies that can accomplish this task without undue generation of secondary wastes.

Summary Result/Endpoint/Deliverable:
Improved solid-based sequestering agents and solid-based media for separating TRUs, Cs, Sr, Tc, noble metals, and RCRA metals from high-level radioactive wastes will be identified, acquired, and tested. Also, new solid sorbents and ion exchangers will be developed for the separation of these constituents from high-level wastes. It is anticipated that each new separations technology that shows promise will be submitted to a total systems analysis via another program.

BDAT: RMETL

Functional Areas: chemical physical treatment
radionuclide removal
removal of problem constituents

Target Site: Cross Complex

Location site: K-25/Y-12 Plant (Oak Ridge)

Programs/Facilities Supported:
Potential cross-complex

ID: 385

Program Title: National Sample Management and Tracking System

Summary Description:
ORNL shall propose, design, and pilot a national system to: 1) track and monitor analytical laboratory utilization and capacity on a real-time basis and 2) provide short and long term projections of laboratory sample analysis needs on a routine basis. Other organizations that will be involved in this project include the EPA Analytical Operations Branch (AOB) through an IAG, INEL (EG&G Idaho), and Hanford (Westinghouse).

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
- Develop a prototype local Sample Management System.
- Develop a prototype integrated Sample Management System.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
Potential cross-complex

ID: 386

Program Title: National Sample Management and Tracking System - RL

Summary Description:
ORNL shall propose, design, and pilot a national system to: 1) track and monitor analytical laboratory utilization and capacity on a real-time basis and 2) provide short and long term projections of laboratory sample analysis needs on a routine basis. Other organizations that will be involved in this project include the EPA Analytical Operations Branch (AOB) through an IAG, INEL (EG&G Idaho), and Hanford (Westinghouse).

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
This task will perform the following tasks:

1. Methods Compendium: Assist technology transfer and guidance in the design and assembly of a validated compendium of DOE analytical chemistry methods, primarily in the mixed waste area.

2 Cost Analysis: Independently develop and document data on the incremental costs of performing various radioactive and non-radioactive laboratory analyses on DOE Environmental Restoration / Waste Management Program samples. The data will include the costs of sample shipment, disposal of residual sample materials, etc.

BDAT: NA

Functional Areas: analytical laboratories

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 387

Program Title: National Sample Management and Tracking System - AL

Summary Description:
ORNL shall propose, design, and pilot a national system to: 1) track and monitor analytical laboratory utilization and capacity on a real-time basis and 2) provide short and long term projections of laboratory sample analysis needs on a routine basis. Other organizations that will be involved in this project include the EPA Analytical Operations Branch (AOB) through an IAG, INEL (EG&G Idaho), and Hanford (Westinghouse).

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
Methods Compendium: This project will participate in the assembly of a validated compendium of analytical chemistry methods. This will be a joint effort among different laboratories. This project will include compiling methods, indexing, maintaining files, and entering methods received into a data base for archiving and manipulation. Concurrently, a method selection and validation scheme and a standard procedure format will be developed to move toward standardized methods.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
Potential cross-complex

ID: 388

Program Title: National Sample Management and Tracking System - RL

Summary Description:
ORNL shall propose, design, and pilot a national system to: 1) track and monitor analytical laboratory utilization and capacity on a real-time basis and 2) provide short and long term projections of laboratory sample analysis needs on a routine basis. Other organizations that will be involved in this project include the EPA Analytical Operations Branch (AOB) through an IAG, INEL (EG&G Idaho), and Hanford (Westinghouse).

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
Methods Compendium: This project will participate in the assembly of a validated compendium of analytical chemistry methods. It will include compiling methods, indexing, maintaining files, and entering methods received into a data base for archiving and manipulation. Concurrently, a method selection and validation scheme and a standard procedure format will be developed to move toward standardized methods.

BDAT: NA

Functional Areas: analytical laboratories

Target Site: Cross Complex

Location site: Savannah River

Programs/Facilities Supported:
Potential cross-complex

ID: 389

Program Title: National Sample Management and Tracking System - SR

Summary Description:
ORNL shall propose, design, and pilot a national system to: 1) track and monitor analytical laboratory utilization and capacity on a real-time basis and 2) provide short and long term projections of laboratory sample analysis needs on a routine basis. Other organizations that will be involved in this project include the EPA Analytical Operations Branch (AOB) through an IAG, INEL (EG&G Idaho), and Hanford (Westinghouse).

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
This project will perform the following tasks:

1. Methods Compendium: Supply an index of all SRS analytical methods to LANL, followed by the methods themselves, for inclusion in the Methods Compendium.

2. Cost Analysis: Provide cost information for on-site and off-site analytical support.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 390

Program Title: Methods Modification--Adapting SW-846 Methods for Mixed Waste Analysis

Summary Description:
This project will provide direct support in adapting existing SW-846 type non-radiological analytical methodology to the analysis of mixed waste and in actually assisting other laboratories to implement these methods in their own facilities. An important aspect of this project is an outreach program to inform other analytical laboratories about this service. The LMD will provide management and direction and will assess any regulatory and policy implications associated with program activities. This technology will be transferred to other labs.

Summary Purpose/Need:
Standardized EPA analytical procedures must be adapted for characterization of radioactive waste.

Summary Result/Endpoint/Deliverable:

- In coordination with ORNL, complete identification and prioritization of additional methods amenable to modification for mixed waste analysis.

- In coordination with ORNL, modify and validate additional methods, making them applicable to the analysis of mixed waste samples and coordinate their incorporation into the Methods Compendium.

- In coordination with ORNL, provide modified and validated methods to LMD, which will submit them to EPA through its IAG with EPA/ORP, for regulatory consideration.

- Begin technology transfer to other labs.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 391

Program Title: Methods Modification--Adapting SW-846 Methods to Mixed Waste Analysis

Summary Description:
This project will provide support in adapting existing SW-846 type non-radiological analytical methodology to the analysis of mixed wastes and in assisting other laboratories to implement these methods in their own facilities. An important aspect of this project is an outreach program to inform other laboratories of this service. The LMD will provide management and direction and will assess any regulatory and policy implications associated with program activities. This technology will be transferred to other labs.

Summary Purpose/Need:
Standardized EPA analytical procedures must be adapted for characterization of radioactive waste.

Summary Result/Endpoint/Deliverable:

- In coordination with ORNL, prepare modifications to SW-846 type non-radiological analytical methods for the analysis of mixed waste.

- As each adapted and validated method is completed, provide the method to ORNL for forwarding to LANL, who will coordinate the incorporation of the method into the Methods Compendium.

- Initiate training and workshops, and technical assistance activities to facilitate implementation of the methods into other DOE Complex laboratories.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
Potential cross-complex

ID: 392

Program Title: Methods Modification

Summary Description:
Modify and adapt existing environmental analytical methods to make them applicable to the analysis of mixed-waste samples. Emphasis will be on widely used EPA methods from SW-846 and other EPA manuals.

Summary Purpose/Need:
Standardized EPA analytical procedures must be adapted for characterization of radioactive waste.

Summary Result/Endpoint/Deliverable:

- ORNL will identify and prioritize methods amenable to modification for mixed waste analysis.
- ORNL will modify and validate the previously identified methods to make them applicable to the analysis of mixed-waste samples.
- ORNL will submit completed methods to LANL for incorporation into the Methods Compendium for dissemination to the rest of the DOE Complex.
- ORNL will submit completed methods to LMD for regulatory consideration through its IAG with EPA/ORP.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 393

Program Title: Field Analyses Methods

Summary Description:
Assess and recommend field analyses technology and methodology for environmental applications of concern to the DOE. The emphasis will be on technology that is currently available commercially or soon to be commercially available. The assessment will involve both radiochemical and non-radiochemical field analyses.

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:

- LANL and ORNL will perform assessments of field analyses methods for chemical (organic and inorganic) contaminants in nonradioactive and radioactive samples.

- LANL and ORNL will perform field trials on the most promising technologies. Laboratory validation will include a comparison of field method results with those generated by standard DOE and/or EPA methods.

- LANL and ORNL will export technology proven effective in field trials to other DOE sites which promise to benefit from these technologies. This will involve development of a laboratory training program using LANL/ORNL facilities and instruments, provision of specifications for the required instrumentation, and continued support through troubleshooting.

- Quality Assurance Management Staff (QAMS) will assist in the implementation of the field trial.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
Potential cross-complex

ID: 394

Program Title: Field Analyses

Summary Description:
Assess and implement field analyses technology and methodology for environmental applications of concern to the DOE. Emphasis will be on technology that is currently, or soon to be available commercially. The assessment will involve both radiochemical and non-radiochemical field analyses. The Quality Assurance Management Staff (QAMS) will assist in the implementation of field analyses via the Data Quality Objective process.

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:

- ORNL and LANL will perform assessments of field analyses methods for chemical (organic and inorganic) contaminants in non-radioactive and radioactive samples.

- ORNL and LANL will perform field trials on the most promising technologies. Laboratory validation will include a comparison of field method results with those generated by standard DOE and/or EPA methods.

- ORNL and LANL will export technology proven effective in field trials to other DOE sites that promise to benefit. This will involve laboratory training using LANL/ORNL facilities and instruments, provision of specifications for the required instrumentation, and continued support through troubleshooting. QAMS will support this transfer.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Oak Ridge National Laboratory (X-10)

Programs/Facilities Supported:
Potential cross-complex

ID: 395

Program Title: Quality Assurance Requirements Document

Summary Description:
This project will support developing detailed outlines of the key elements that should be contained in a radiochemical and non-radiochemical and field sampling/analysis Quality Assurance Requirements Document. These outlines, upon approval, will form the basis for developing the requirements document that each program will follow in preparing their site-specific QA/QC procedures to assure the generation of credible environmental data.

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:

- Develop a QA Requirements Document for environmental sampling and analysis.

- Developing supplemental documents to the QARD (PE, data assessment, etc.) as directed by LMD.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 396

Program Title: Performance Evaluation

Summary Description:
This project will develop a comprehensive interlaboratory performance evaluation program to provide information on the quality of radiological mixed waste and non-radiological sample data being produced by all laboratories analyzing DOE samples.

Summary Purpose/Need:
The program will address coordination to reduce unnecessary or redundant evaluations performed internally by other DOE operations and by external programs, e.g., US EPA, DOD, states, etc.

Summary Result/Endpoint/Deliverable:

- Develop the performance evaluation sample results data base and enter results from participating DOE Complex and subcontractor laboratories

- Be responsible for the implementation and application of performance evaluation (PE) software (Interagency Agreement technology transfer products) to assess performance, identify laboratory problems, and track corrective action

- Have lead responsibility for providing and coordinating information on the non-radioactive performance evaluations from other agencies and integrating these data into the overall program.

- Assist in development of radiological and non-radiological PE program requirements, e.g. recommending analytes, matrices, concentration ranges, and evaluation frequency
- Assist in defining and recommending strategies for defining mixed-waste PE material needs.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 397

Program Title: Quality Assessment (Performance Evaluation Program)

Summary Description:
Under the direction of the Laboratory Management Division (LMD), the Environmental Measurements Laboratory (EML) will provide support for the continued operation of the Quality Assessment Program (QAP), required by DOE Order 5400.1 Ch 4.10.C. The QAP is an environmental radiological performance evaluation program. EML will continue to carry out their previous activities associated with QAP.
Under LMD direction, EML will participate with Argonne National Laboratory (ANL) and RESL in the development and implementation of an Integrated Performance Evaluation Program (IPEP) capable of providing information on the quality of radiological and non-radiological environmental data. EML's specific area of responsibility will be in radiological sample development, through the enhancements to the Quality Assessment Program (QAP). The program will address coordination to reduce unnecessary or redundant evaluations performed internally by other DOE operations and by external programs, e.g., US EPA, DOD, states, etc.
In the future, EML will also provide reports to the Acting Director of LMD on the performance of laboratories and DOE facilities as a group. The report shall include interpretations and evaluations identifying specific laboratory performance problems.

Summary Purpose/Need:
The program will address coordination to reduce unnecessary or redundant evaluations performed internally by other DOE operations and by external programs, e.g., US EPA, DOD, states, etc.

Summary Result/Endpoint/Deliverable:
- Prepare, distribute, and compile a survey of EM facilities to determine pertinent information and future analytical needs that will enhance QAP.
- In coordination with ANL, enhance the QAP evaluation and reporting systems and integrate the QAP into the IPEP.
- Prepare, evaluate, and distribute radiological performance evaluation samples semi-annually to DOE contractors.
- Test, interpret, and evaluate the reported results.
- Prepare reports summarizing results for each participating laboratory and for each matrix type.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 398

Program Title: Performance Evaluation Program

Summary Description:
Under the direction of the Laboratory Management Division (LMD), the Radiological and Environmental Sciences Laboratory (RESL) will provide the field lead in developing the Integrated Performance Evaluation Program to support the analysis of mixed wastes. The Program will include support from the Environmental Measurements Laboratory (EML); Argonne National Laboratory (ANL); and EPA Environmental Monitoring Systems Laboratories-Las Vegas and Cincinnati (EMSL-LV/EMSL-Ci). EML has the lead for radiological analysis performance evaluations and ANL will coordinate input from other programs, e.g., EPA (CLP) quarterly blinds, NPDES (WP), and drinking water programs (WS), on non-radiological performance evaluation.

Summary Purpose/Need:
The program will address coordination to reduce unnecessary or redundant evaluations performed internally by other DOE operations and by external programs, e.g., US EPA, DOD, states, etc.

Summary Result/Endpoint/Deliverable:

- Examine existing external (NIST, EPA, etc.) and internal (EML) performance evaluation (PE) programs to determine their applicability to the assessment of mixed waste analyses.

- Support development by ANL of a data base to contain the results of analyses performed on PE samples. The data base will enable one to evaluate trends in results, assess performance, identify problems in reporting and track corrective actions.

- Design, develop and implement PE samples to assess mixed waste analyses.

- Develop and implement an internal QC program for the preparation and verification of PE materials.

- Support integration of audit program and corrective action activities with the integrated PE program.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Idaho

Programs/Facilities Supported:
Potential cross-complex

ID: 399

Program Title: Audit Program

Summary Description:
Under the direction of the Laboratory Management Division (LMD), the Radiological and Environmental Sciences Laboratory (RESL), and Environmental Monitoring Laboratory (EML) will develop a comprehensive audit program required to conduct independent assessments of laboratory capabilities and performance. This program will include the identification, training, and coordination of the technically staffed audit teams, and conduct of audits. RESL's primary responsibility will be in the development of audit procedures for laboratory activities. EML's primary responsibility involves field sampling and measurement activities. However, RESL and EML will both participate in overall program development. Additional participants include Argonne National Laboratory (ANL) and EPA Environmental Monitoring Systems Laboratories--Las Vegas and Cincinnati (EMSL-LV/EMSL-Ci)

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:

- Examine existing external (NIST, EPA, etc.) audit programs to determine their applicability to LMD's QA program.

- Develop an outline, draft, and final report suggesting those external audit programs to be incorporated in the ASP QA Program

- Develop an outline, draft, and final report recommending internal audit standards

- Identify at least two government owned/corporation operated (GOCO) analytical laboratories and conduct an audit to assess the preliminary standards

- Develop an outline, draft, and final report containing findings on the assessment of preliminary audit standards of the GOCO analytical laboratories

- Develop a list of suggested auditors with the required expertise to participate in the program

- Develop a recommended schedule with suggested audit team members. The schedule will consider the geographic assignment of team members in order to control travel costs.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 400

Program Title: Audit Program

Summary Description:
Under the direction of the Laboratory Management Division (LMD), the Environmental Measurements Laboratory (EML) will work with the Radiological and Environmental Sciences Laboratory (RESL) to develop a comprehensive program for effectively auditing DOE Complex and external laboratories to ensure that data collection operations comply with DOE QA requirements and laboratory-specific QA/QC requirements. EML's specific area of responsibility will be to address auditing of field sampling and field measurement activities and the QA/QC management methods employed in these areas. The program will address coordination to reduce unnecessary or redundant audits performed internally by other DOE operations and by external programs, e.g., US EPA, DOD, states, etc. Audit procedures should be based on the specific purpose (e.g., routine technical support, suspect quality problems, or program management). Alternative, innovative approaches will be considered.

Summary Purpose/Need:
The program will address coordination to reduce unnecessary or redundant evaluations performed internally by other DOE operations and by external programs, e.g., US EPA, DOD, states, etc.

Summary Result/Endpoint/Deliverable:
Develop operational audit standards for field sampling and field measurements, and associated QA/QC management methods.
Conduct pilot audits to evaluate the operational audit standards and revise standards as appropriate.
Prepare a report containing recommended field audit schedules and suggested audit team members and training.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 401

Program Title: Analytical Cost Reduction (Blind Compliance)

Summary Description:
LANL site TA-10 has been identified as the site on which the Data Quality Objectives (DQO)/Blind Compliance pilot will be conducted. This pilot will determine whether the DQO process, successfully tested on EPA Superfund cleanups, can be equally successful in reducing the cost and duration of a DOE mixed-waste cleanup, specifically, by reducing the number of samples requiring analysis.

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
Develop DQO for TA-10 Pilot Study on contaminated soil clean-up.
Apply DQO process and resulting design optimization in actual clean-up of TA-10.
Prepare report on specific methodologies used for TA-10 clean-up.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Hanford

Programs/Facilities Supported:
Potential cross-complex

ID: 402

Program Title: Richland Operations Office Program Support Division

Summary Description:
Under the direction of the Laboratory Management Division (LMD), the following tasks will be performed at Hanford, Washington so that the Data Quality Objective (DQO) process can be effectively employed on Hanford projects.

Data Assessment

- Identify possible unit operations at Hanford that can benefit from employing the DQO process.
- Develop a workplan for desired unit operation.
- Employ the DQO process to streamlining the design of cleanup at the selected unit operation.

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
See summary description.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: Argonne National Laboratory

Programs/Facilities Supported:
Potential cross-complex

ID: 403

Program Title: DQO Guidance Development

Summary Description:
This project will develop DQO process guidance for various EM waste operations and environmental restoration activities that require new environmental data. It will include modification of existing DQO processes developed over the last 9 years to incorporate DQO-specific tank, drum, soil, ground water, and air contamination problems. It will also develop associated case studies and pilots to document the effectiveness of the guidance materials and provide technical support to the field to assure effective implementation. In addition, it will develop training materials for institutionalizing DQO guidance.

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
1. Prepare detailed structure of guidance
2. Develop individual case studies for applying guidance.
3. Develop training materials.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site:

Programs/Facilities Supported:
Potential cross-complex

ID: 404

Program Title: Interagency Agreement with the EPA Quality Assurance Management Staff

Summary Description:
This project will provide assistance to the lead DOE groups in the preparation of a laboratory Methods Compendium applicable to hazardous and mixed wastes, development of an approach for reducing analytical costs by more effectively defining specific data needs, and evaluation of approaches for establishing data confidence.

1. Methods Compendium: Provide assistance and guidance on the approach and format, based on experience in compiling methods for various EPA regulatory programs.

2. Analytical Costs Reduction: A joint project to pilot streamlined approach to site cleanup:

3. Establishing data confidence by developing guidance in data validation

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
See summary description.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: NAREL

Programs/Facilities Supported:
Potential cross-complex

ID: 405

Program Title: Interagency Agreement with the EPA Office of Radiation Programs

Summary Description:
This project will provide assistance to the lead DOE groups in the preparation of a laboratory Methods Compendium applicable to hazardous and mixed wastes and in the development of a quality assurance technical requirements document applicable to mixed waste methods.

1. Collect and review radioanalytical procedures from EPA facilities and forward them to LMD and LANL for inclusion in the Methods Compendium.

2. Review and provide input to LMD and LANL on both the Compendium data base format and the analytical methods format.

3. Review Compendium radioanalytical and mixed waste method for applicability to and inclusion in EPA regulatory programs.

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
See summary description.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

4695

Target Site: Cross Complex

Location site: EMSL-Las Vegas

Programs/Facilities Supported:
Potential cross-complex

ID: 406

Program Title: Interagency Agreement with the EPA Environmental Monitoring Systems Laboratory

Summary Description:
This project will provide assistance to the lead DOE group in the preparation of a laboratory Methods Compendium applicable to hazardous and mixed wastes, the development of a comprehensive Audit Program for DOE internal and external laboratories, and the development of a comprehensive Performance Evaluation (PE) Program for laboratories supporting DOE environmental operations.

1. Methods Compendium: Review and provide input on the compendium method elements, data base structure, and the analytical methods format.

2. Auditing Program

- Provide program input and review audit materials for both laboratory and field data collection activities

- Provide technology transfer of automated audit procedures for the evaluation of computer-readable data submissions.

- Provide technology transfer of software developed for integrated tracking and trending of laboratory evaluation data

3. Performance Evaluation Program

- Provide PE samples and statistical analysis of program results

and assist in the transfer of PE statistical analysis and program management software for assessment, adaptation, and implementation of LMD Program needs.

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
See summary description.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site: EMSL-Cincinnati

Programs/Facilities Supported:
Potential cross-complex

ID: 407

Program Title: Interagency Agreement with the EPA Environmental Monitoring Systems Laboratory

Summary Description:
This project will provide assistance to the lead DOE group in the preparation of a laboratory Methods Compendium applicable to hazardous and mixed wastes, the development of a comprehensive Audit Program for DOE internal and external laboratories, and the development of a comprehensive Performance Evaluation (PE) Program for laboratories supporting DOE environmental operations.

1. Methods Compendium: Provide copies of EMSL-Ci analytical methods on non-radiochemical analyses and comments and recommendations on the proposed program for methods validation.

2. Audit Program: Participate in evaluating the pilot test of the proposed Audit Program and comment on the results of the pilot.

3. Performance Evaluation Program
- Provide Discharge Monitoring Report (DMR) performance evaluation samples to locations designated by LMD.
- Provide advice for the design and procurement of the broad range of PE samples and database
- Provide standard materials from various sample repositories under EMSL-Ci direction, as requested by operating groups.

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
See summary description.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site:

Programs/Facilities Supported:
Potential cross-complex

ID: 408

Program Title: Interagency Agreement with the Analytical Operations Branch

Summary Description:
The EPA Analytical Operations Branch (AOB) will provide assistance in the transfer of Superfund analytical services technology, e.g., development of a sample management infrastructure, an approach for managing sample analysis data on a national basis, approaches for identifying and evaluating flawed data, a national analytical QA/QC program, and standard analytical contract language for ensuring the acquisition of consistent, compatible, comprehensive data from all analytical support services used.

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
Sample Management System
- Provide assistance in defining requirements and procedures for local Sample Management Offices.
- Assist in implementation of local Sample Management Offices.

National Information Management System for Analytical Data
- Assist in defining national data element dictionary.
- Provide advice in defining functional requirements for local data base systems for analytical data.
- Provide assistance in developing & implementing data interchange protocols:
  - Field to Department of Energy (DOE) Headquarters data transfers, and
  - DOE to EPA transfers.

Automated Data Review & Validation
- Develop, modify, and assist in implementing software programs for automated data review and validation.
- Consult on applying artificial intelligence to data evaluation.

Analytical Quality Assurance
- Provide CLP performance evaluation samples and automatic scoring software.
- Provide assistance in developing "double blind" performance evaluation samples.

Standard Analytical Contract Requirements
- Assist in developing technical performance requirements.
- Assist in developing standard reporting requirements (including electronic).

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Cross Complex

Location site:

Programs/Facilities Supported:
Potential cross-complex

ID: 409

Program Title: MACTEC

Summary Description:
Analytical Services Program Support

- Provide the support needed to continue obtaining current information on sampling and analysis needs and capabilities for each major DOE site performing waste management operations and environmental restoration.

- Provide support in determining analysis capabilities in the private sector.

- Provide support in development of QA requirements and procedures.

- Provide support on developing guidance and institutionalizing the DQO process in DOE's environmental programs.

- Provide support on minimum health and safety requirements to be imposed on commercial laboratories analyzing mixed and radioactive waste.

- Provide support on establishing the maximum level of radiological contamination allowed to be shipped to the commercial sector for analysis.

- Provide support in development of a process for performance management systems reviews.

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

4695

Target Site: Fernald

Location site: Fernald

Programs/Facilities Supported:
CERCLA ROD

ID: 410

Program Title: Soil Washing Treatability Study

Summary Description:
A Soil washing treatability study is currently being conducted under the guidance of CRU5. The guidelines for this study, contained in the Treatability Study Work Plan for Operable Unit 5: Soil Washing, adhere to EPA's Guidelines for Conducing Treatability Studies under CERCLA. The study, in support of evaluating remedial alternatives for soil as part of CRU5's RI/FS, is designed to conduct both remedy-screening and remedy selection testing. Soil washing is a physical/chemical treatment process that initially involves the separation of soil into different particle-size fractions. Reagent formulations in the washing solutions are used in the extraction of radionuclides and organic and inorganic compounds from these different size fractions. The contaminants may be separated from the wash stream into a concentrated residue for further treatment (e.g., stabilization or vitrifiication). Remedy-screening tests consist of bench-scale studies designed to evaluate individual treatment processes potentially applicable for soil washing. Results from this testing aid in selecting specific treatment processes that can be tested on a pilot-scale level during remedy-selection testing. Remedy-selection testing consist of combining physical separation techniques with chemical extraction processes into a single treatment process. The testing of this process on a a pilot-scale level enables both the processes and the results to be directly scalable to a full size soil washing operating system.

Summary Purpose/Need:
The purpose of this treatability study is to generate data for the detailed analysis of alternatives in the FS. A primary consideration is to integrate the soil washing treatability technology being evaluated in this study with other technology evaluations being conducted for on-site remediation of CRU5.

Summary Result/Endpoint/Deliverable:
All design work for the soil washing process system and support utilities has been completed. The fabrication of all skids has also been completed by a local Cincinnati construction company. All project related documentation and startup support activities are on schedule. The installation of the soil washing pilot-plant is scheduled for completion by the later part of March. Anticipated system startup of the system is projected for the first week in April, 1993. The requirements of the Treatability Study Work Plan will be satisfied during the initial operation of the process. A phased approach for operation of the pilot system is currently being developed for the next twelve (12) months. Priorities during this period include batch process optimization, ID Program requirements, and conversion of the process to a continuous operating mode.

BDAT: RMETL PRECP NEUTR

Functional Areas: chemical physical treatment
radionuclide removal

371

Target Site: Cross Complex

Location site: ORNL

Programs/Facilities Supported:
Potential cross-complex

ID: 411

Program Title: National Sample Management and Tracking System

Summary Description:
ORNL shall propose, design, and pilot a national system to: 1) track and monitor analytical laboratory utilization and capacity on a real-time basis and 2) provide short and long term projections of laboratory sample analysis needs on a routine basis. Other organizations that will be involved in this project include the EPA Analytical Operations Branch (AOB) through an IAG, INEL (EG&G Idaho), and Hanford (Westinghouse).

Summary Purpose/Need:
See above description for purpose/need

Summary Result/Endpoint/Deliverable:
- Develop a prototype local Sample Management System.
- Develop a prototype integrated Sample Management System.

BDAT: NA

Functional Areas: analytical laboratories
characterization, monitoring & assay

Target Site: Savannah River

Location site: Savannah River

Programs/Facilities Supported:
Proposed Hazardous/Mixed Waste Disposal Facility

ID: 413

Program Title: Radiological Performance Assessment

Summary Description:
Radiological disposal facilities require a radiological performance to be conducted to insure the environment will be protected per DOE Order 5820.2A. This includes source term determination, degradation modeling, geochemistry, vadose zone and saturated zone contaminant migration modeling, and risk assessment.

Summary Purpose/Need:
DOE radiological disposal facilities must protect the public from radiological hazards for at least 10,000 years in the future. This radiological performance assessment assures that this requirement will be met.

Summary Result/Endpoint/Deliverable:
The radiological performance assessment will demonstrate that the proposed Hazardous/Mixed Waste Disposal Facility will protect the public.

BDAT: NA

Functional Areas: final form
system analysis

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
LANL MWTP

ID: 414

Program Title: Delphi DETOX

Summary Description:
Delphi DETOX is a wet air oxidation process using an aqueous solution of concentrated hydrochloric acid and the iron 2 - iron 3 couple to catalyze the oxidation of organics. The process operates at approximately 200 C and 50 to 150 psi.

Summary Purpose/Need:
Proposed alternative process to incineration.

Summary Result/Endpoint/Deliverable:
A proto scale process to demonstrate the overall effectiveness of the process.

BDAT: WETOX INCIN CHOXD IMERC

Functional Areas: waste destruction & stabilization
alternative organic destruction - high concentration
alternative organic destruction - low concentration
innovative technologies

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
LANL MWTP, and cross-complex

ID: 415

Program Title: Process Modeling-Mixed Waste Treatment

Summary Description:
Many methods of treating mixed waste have been proposed. Process modeling of these technologies provides a convenient tool for evaluating the various methods for merit without having to build hardware for experimentation. Modeling is also a useful tool for investigating and optimizing promising technologies during the design stage. The scope of this development is to model all proposed mixed waste treatment methods and promote the promising candidates. The goal is to deliver analyses of the proposed technologies.

Summary Purpose/Need:
Process modeling is a well-developed technology. Commercial codes are available for the chemical engineers as tools. The development work involved in this program is to use one of these commercial codes, ASPEN plus, to model the mixed waste technologies. It is a matter of building the various components of the model into a process flowsheet and using this information to compare technologies.

Summary Result/Endpoint/Deliverable:
The result will be a series of reports, one for each proposed mixed waste treatment technology, that provides the merits and drawbacks to each technology based on the results of the process model.

BDAT: NA

Functional Areas: system analysis
decision support

375

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Controlled Air Incinerator

ID: 416

Program Title: CAI Vitrification

Summary Description:
Develop, demonstrate, and implement vitrification system to immobilize ashes generated by the Control Air Incinerator.

Summary Purpose/Need:
LANL specific system = bench scale
Design based on standard equipment used in glass industry for +100 years. Additional experiments in DOE with high level vitrification.

Summary Result/Endpoint/Deliverable:
Bench-scale testing - equipment specification and product testing
Pilot-scale testing - design parameters and glove box design

BDAT: STABL HLVIT

Functional Areas: final form
final form glass

4695

Target Site: Pantex

Location site: Pantex

Programs/Facilities Supported:
Pantex Plant LDR Compliance Program

ID: 417

Program Title: Immobilization of MLLW at Pantex Plant

Summary Description:
Treatability studies are currently underway to evaluate effectiveness of various sealants and encapsulants such as formaldehyde, polystyrene, polyurethane, polybutadiene, polyethelene, and cement. These treatability studies are being conducted on the following general waste forms: weapons support material (paper, plastic, rubber, wood, etc.), burning ground ash, and demilitarized/sanitized weapons components. These wastes represent the majority of Pantex MLLW. Proof of process has been successfully demonstrated full scale on weapons support material debris encapsulated with polyurethane.

Summary Purpose/Need:
Immobilization technologies generally are considered the best available practical treatment for all existing LDR MLLW at Pantex Plant.

Summary Result/Endpoint/Deliverable:

Based on results from treatability studies, full scale proof of process demonstrations will be conducted for each MLLW waste stream, including debris and non-debris wastes.

BDAT: STABL

Functional Areas: final form

377

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
Weapons manufacturing - complex 21

ID: 418

Program Title: Chip Collection System for Precision Machining

Summary Description:
This program reduces the machinist workers exposure to toxic and radioactive materials by automatically collecting the chips from the machining process. This also reduces the use of solvents to clean areas and thus reduces mixed waste production.

Summary Purpose/Need:
In machining operations, the chips have to be collected after the part is complete. If these chips are toxic or radioactive, the worker is exposed to this hazard. By collecting automatically, the exposure is reduced.

Summary Result/Endpoint/Deliverable:
The deliverable is a system for automatically collecting toxic and radioactive chips during the machining process.

BDAT: NA

Functional Areas: waste minimization

4695

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:
TA-55 Pu processing at LANL and other similar activities in DOE complex

ID: 419

Program Title: Biodegradation of nitrated rags

Summary Description:
Develop, demonstrate, and implement a process for reducing the volume of nitrated rags with radioactive contamination. The approach involves biodegradation of the organic matrix and nitrates, resulting in an output stream which is suitable for subsequent recovery or removal of the radioactive constituents.

Summary Purpose/Need:
Rags contaminated with nitrates and radioactive material are currently stored. This approach involves biodegradation of the organic matrix and nitrates with a substantial volume reduction, resulting in an aqueous output stream which is suitable for subsequent recovery or removal of the radioactive constituents, and waste processing.

Summary Result/Endpoint/Deliverable:
Based on the small scale demonstration results, adaptation of standard operating methods will be considered to eliminate the stored material, and for potential inclusion in future Pu processing at LANL. If successful, the approach could be applicable to other similar activities in DOE complex.

BDAT: BIODG

Functional Areas: chemical physical treatment
waste destruction & stabilization

379

Target Site: Los Alamos National Laboratory

Location site: Los Alamos National Laboratory

Programs/Facilities Supported:

Supports all tritium programs/facilities.
Supports WETF operations.

ID: 420

Program Title: Tritium Gas Recovery/Recycle from Tritium Confinement Systems

Summary Description:
Develop, demonstrate, and implement a system for recovering elemental tritium from weapons without generating tritiated water.

Summary Purpose/Need:
We need to be able to recover tritium from weapons dismantlement without converting elemental tritium into a compound (tritiated water) which is 25,000 times more toxic than the elemental tritium. This will aid the recovery at WETF.

Summary Result/Endpoint/Deliverable:
The scope of the activity will be to investigate commercially available gas separation module technology with the goal of designing a tritium gas recovery system for use at WETF. This technology can then be licensed commercially.

BDAT: NA

Functional Areas: other

APPENDIX C

OTHER MATERIALS

This Appendix discusses certain radioactive materials that do not fit within the category of mixed waste but which have been included in the report for reasons stated below. Many of these materials are currently the subject of an ongoing DOE initiative to inventory material being held for reuse, recovery, recycle, or resale in order to ensure they are included in DOE's planning and decision-making process.

As a result of this assessment, some of these materials may be determined to be unnecessary for future needs and thus become waste. Other materials are identified in this section because their regulatory status is currently being discussed with regulators or because a provision of the FFCAct-1992 appears to contemplate the inclusion of some information pertaining to non-mixed radioactive waste.

These materials fall into three general groups and are not categorized as mixed waste:

(1) radioactive materials not categorized as waste,
(2) non-mixed low-level radioactive waste, and
(3) spent nuclear fuel.

Additionally, this Apendix discusses Naval Nuclear Propulsion Program wastes and spent fuel, and DOE moratorium wastes.

C.1 Radioactive Materials Not Categorized As Waste

These materials generally fall into two categories: (1) materials which are the subject of a continuing DOE inventory re-evaluation in light of changed circumstances and which, as a result of that re-evaluation, could be determined to be in excess of program needs and, (2) materials that are currently the subject of unresolved regulatory disagreements and for which the regulatory status is therefore unclear.

C.1.1 Materials in Storage

The first category consists of materials held in storage in support of long-standing DOE missions. For many years the principal DOE mission has been nuclear weapons production and related research and development, including production of special nuclear and strategic materials. The DOE also supplied nuclear materials for other research and development not related to nuclear weapons and for support of the demonstration of the use of nuclear reactors for the production of commercial electrical power.

Recent geopolitical changes have resulted in a rapid re-focus DOE's defense mission from one largely of weapons production to one focused on maintaining and upgrading the safety and security of the existing weapon stockpile. Concurrently, DOE has initiated major site cleanup activities at its sites. As a result of these changes, a significant amount of materials in storage may be determined to be in excess of the DOE's needs.

Although past evaluation by DOE of the need for these materials has concluded that they are not waste and are needed to support DOE's mission, DOE is now taking formal steps to re-evaluate current and future material needs. This continuing re-evaluation requires the collection of data on existing materials throughout the complex. Only limited applicable data on these materials are available, and they are not on any central database. The DOE has recently requested these data from the sites and will include

additional information in updates to the inventory report. This data collection activity will continue to support DOE's efforts to:

1. Provide policy and guidance to the sites to support continued storage of those materials determined to have an identifiable future purpose.

2. Facilitate waste minimization by identifying materials at one site which could support activities at another site.

3. Identify materials that are now, or could in the future be determined to be, in excess of program needs and plan for compliant treatment, storage, and disposal. This data will also be useful in discussions with regulators to resolve regulatory issues which arise.

DOE has already begun discussions with EPA to address these materials. In some instances, similar discussions are ongoing with state regulators.

C.1.2 Materials Under Regulatory Review

Materials in the second category (materials currently the subject of unresolved regulatory disagreement) are identified below. Discussions with affected regulators on the regulatory status of certain materials have, in some cases, resulted in formal disagreement between the two parties. During discussions on the potential content of the inventory report it was suggested that DOE include these materials in the report. Inasmuch as the outcome of these disagreements is uncertain, DOE has included these materials in the report but has not denominated them as "mixed waste".

- Metallic Sodium - some experimental reactors used liquid metallic sodium as the heat transfer medium for dissipating heat generated by the fission process. This sodium, currently in storage at the Idaho Nuclear Engineering Laboratory (INEL), is a valuable resource for potential reuse because it is of exceptionally high purity and costly to replace. The minor amounts of contamination or induced radioactivity in this sodium do not prevent its reuse as a coolant material.

- Uranium Hexafluoride - a large quantity of uranium depleted in the isotope ^{235}U is generated as a coproduct during the production of enriched uranium. Some of this material is currently in storage at the Portsmouth facility. It is stored as solid uranium hexafluoride, under low or subatmospheric pressure, in 5/16-inch walled steel cylinders each weighing about 14 tons. This material has an economic value as a source material of additional ^{235}U and/or as depleted uranium metal for other strategic applications, and can be reintroduced into a process line.

Inclusion of these materials in the report does not suggest any alteration in DOE's position on the regulatory status of these materials. The ultimate determination on the regulatory status of these materials could impact similar materials currently in storage at other DOE sites.

Quantitative data on the amount of these two materials is included in Table C.1.

C.2 Non-Mixed Radioactive Low-Level Waste

Section 3021(a)(2)(F) of RCRA, as amended by the Act, requires that DOE provide an "inventory of each type of waste that has not been characterized by sampling and analysis at each Department of Energy facility in each state" (emphasis added). This provision refers only to "waste" and thereby differs from other requirements of section 3021(a)(2) which require that the information to be reported is for "mixed waste". This provision also is contained in Section 3021(a) entitled "MIXED WASTE INVENTORY REPORTS." Due to the uncertainty regarding whether this provision applies to "waste" or only to "mixed waste," DOE has decided to adopt a conservative interpretation and provide information on radioactive waste which has been determined to be non-mixed. The low-level waste (LLW) stored at DOE sites falls into this category. The categorization of the waste as non-mixed is based on process knowledge and/or sampling and analysis; however, the sampling and analysis techniques when used may not fully comport with EPA protocols for sampling and analysis of hazardous constituents. Information on mixed low level wastes and how they have been characterized is included elsewhere in the "mixed waste" portions of this report.

Table C.2 includes data on stored LLW where the major radioactive characteristic derives from: uranium/thorium, fission products, induced activity, tritium, or alpha contamination. The non-hazardous waste matrices range from sludges and other relatively homogeneous solids to miscellaneous trash (paper, cloth and protective clothing, glassware, tools, etc.) from routine process operations and maintenance activities where hazardous substances are not employed.

In 1991, the DOE generated nearly 76,000 cubic meters of non-mixed LLW, and more than 53,000 cubic meters were disposed in existing DOE LLW disposal facilities. Radioactive LLW is normally disposed shortly after generation; however, some sites do not have an on-site disposal capability and currently are unable to ship their LLW to another site for disposal. Therefore, over 150,000 cubic meters of non-mixed LLW was in storage at DOE sites as of December 31, 1992. Table C.2 provides data on the quantity stored by site. This data was taken from a recent update of the DOE Waste Management Information System (WMIS) which supports the data in DOE/RW-0006, the DOE's Integrated Data Base published annually, describing U.S. Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics.

About 127,000 cubic meters of this total (or about 85 percent) is uranium/thorium contaminated waste at the uranium/thorium production and handling sites and at the DOE gaseous diffusion facilities. Another 11 percent is LLW contaminated with alpha activity which cannot be shipped and/or exceeds the local site criteria for disposal by direct burial but is not TRU waste. The remainder is contaminated with fission products or tritium or contains induced activity.

At least 80 percent of the total has been characterized as non-mixed LLW based on process knowledge. While some sampling and analytical techniques have been used for categorization of this material, it was not necessarily performed using EPA protocols for sampling and analysis of hazardous constituents. Process knowledge for operating processes is based on engineering analysis and technical knowledge of the chemical and physical interactions of materials introduced into a specific process stream for which process parameters have been established and documented. The chemicals used are controlled and documented, including application of stringent procurement specifications, Material Safety Data Sheets based on the manufacturer's analyses of chemicals procured, and site verifications based on independent analyses at the receiving site. All processes have been subject to design review and safety analyses and

are performed using detailed, documented procedures. Deliberate process changes require documented changes in procedures subject to approval by the organizational units which approved the original procedures. Established quality assurance and quality control programs document any significant deviations from procedures and verify that process modifications do not result in unacceptable changes to products and process streams. These steps, in combination, provide a sound basis for the use of process knowledge to differentiate between mixed and non-mixed radioactive low-level waste.

C.3 Spent Nuclear Fuel

Historically, spent nuclear fuel (SNF) irradiated for defense purposes was chemically reprocessed to recover valuable products and fissionable materials. High level waste, transuranic waste, and mixed low-level waste generated by reprocessing is discussed elsewhere in this document. In April 1992, the Secretary of Energy announced the phase-out of reprocessing for the recovery of highly enriched uranium.

The DOE is responsible for two general types of SNF. The bulk of this fuel is from defense activities within the Department and its predecessor agencies for the production of special nuclear material and tritium for use in nuclear weapons, and is located at the Savannah River Site and at Hanford. A much smaller amount of SNF from demonstrations related to nuclear power generation and in training and research reactors at university or government facilities is stored at a number of sites.

Table C.3 summarizes the amounts of these two types of SNF in DOE storage, currently a total quantity of about 2,500 metric tons. An aggregate number is given in the Table for the small quantity of university fuels which are owned by the DOE but currently stored at about 60 universities. By way of comparison with the DOE total, at the end of 1991 the cumulative amount of SNF from the nation's commercial utility reactors was 23,681 metric tons and the incremental amount added in 1991 was 1,915 metric tons. (DOE/RW-0006, Rev.8, Integrated Data Base for 1992: U.S.Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics, October 1992.)

DOE SNF is stored in facilities which provide isolation from the biosphere and removal of heat. Most fuel is stored under water in storage pools. The water acts as a heat exchange medium to carry away the decay heat and also as a shield to protect against radiation. SNF which cannot be stored under water because of its physical or chemical properties is stored dry in suitable shielding.

DOE has initiated discussions with EPA on the potential applicability of RCRA to this material and to address sampling and analysis protocols due to the diverse types of SNF in storage across the complex and the associated radiological concerns. In the interim, DOE has elected to include this material in the report.

C.4 Naval Nuclear Propulsion Program

The following information is provided regarding Naval Nuclear Propulsion Program process knowledge, spent nuclear fuel, and excess equipment containing heavy metals:

C.4.1 Process Knowledge Determination of Mixed Waste Pertaining to Naval Nuclear Propulsion Program Activities.

In determining whether a radioactive waste is also hazardous, the Naval Nuclear Propulsion Program (NNPP) employs process knowledge based on engineering and technical knowledge of materials used, reactions that occur, and materials that result from particular processes. Process knowledge determinations can rely on factors such as material safety data sheets, technical data sheets, procurement specifications and engineering assessments. Characterization of continuing mixed process streams relies on process knowledge where past determinations have been made and the waste stream remains unchanged.

Work involving radioactivity is done pursuant to detailed workplans developed for that specific job. These workplans are reviewed for use of RCRA "listed" hazardous substances. Unless substitution of a hazardous substance is technically unacceptable, nonhazardous substances are used. This has resulted in avoiding the use of solvents such as acetone, methylene chloride and trichloroethane. Workplans are also reviewed for use of substances resulting in waste with RCRA hazardous characteristics. Where technically acceptable, non-hazardous substances are used. For example, decontamination and cleaning solutions are typically alcohol in water solutions to ensure resulting waste does not exhibit the characteristic of ignitability.

These advance preparations prior to conducting work also help identify waste streams that potentially have hazardous constituents. Waste streams are evaluated for the possibility of having RCRA listed hazardous components and characteristic hazardous components. The more difficult hazardous characteristic to determine is the toxicity characteristic, which is determined by review under the toxicity characteristic leaching procedure (TCLP).

In using process knowledge to evaluate for toxicity characteristics, a waste stream is screened for thresholds based on process knowledge, calculations and conservative assumptions on the concentration of hazardous constituents. Such screening includes comparing a waste stream to similar streams for which an evaluation has been completed; comparing the concentration of hazardous constituents contained in a mixed process stream directly with the TCLP concentrations (data for making this comparison may be available in the form of chemical reagent compositions or component material chemical compositions); employing 20:1 weight ratio of weak acid to tested material required by the TCLP test; and obtaining actual data (e.g., from equipment specifications) on the concentration of hazardous constituents rather than using unduly conservative assumptions (which may be appropriate if little was known about the waste).

Sampling and analysis on mock-up (non-radioactive) materials is done where process knowledge is insufficient and a representative sample can be constructed. This has been done for several low-level radioactive waste streams and is the preferred method of sampling and analysis when process knowledge is inconclusive.

Low-level radioactive waste streams where process knowledge has been sufficient to demonstrate that waste is not mixed waste include equipment that does not have lead shielding, cloths, plastics, glass, and insulation. These waste streams will continue to be managed and disposed of in accordance with Naval Nuclear Propulsion Program requirements and applicable DOE and NRC requirements. Pursuant to Program requirements, low-level radioactive waste is shipped to a disposal facility as soon as sufficient

quantity is available for an economic shipment. Such waste streams have not been included in the mixed waste inventory. Where process knowledge is not adequate and additional characterization and sampling is required, those waste streams have been identified and included in this report.

C.4.2 Spent Naval Nuclear Fuel.

Since naval nuclear fuel must meet stringent military requirements, it is designed and constructed with exceptionally rugged properties, which also affect characterization under RCRA. These military requirements include the fuel's ability to withstand combat shock, to sustain rapid power changes (from 0 percent power to 100 percent power in minutes), and to retain its radioactivity for minimizing exposure of the crew (which must live and work in close proximity to the reactor). In particular, naval fuel, when compared to commercial fuel, can withstand more than 10 times as much dynamic shock, and releases no fission products in normal operation. Naval fuel is highly corrosion resistant; for example, reactor cores removed from the U.S.S. ENTERPRISE during her last refueling in 1992 successfully operated for 20 years.

In reviewing whether spent naval fuel represents a mixed waste, the following was considered.

A material must be a solid waste before the RCRA hazardous waste controls may be applied. While spent naval fuel may be considered a solid waste while held pending placement in a geologic repository, naval fuel contains enriched uranium that can still be recovered if economically justified in the future.

Once a material is determined to be a solid waste, it must be characterized to determine whether it is also a RCRA hazardous waste. The first thing to consider is whether spent naval fuel contains constituents specifically listed as hazardous. No listed constituents are present in spent naval fuel nor added as part of the research and development activities performed on spent naval fuel following removal from a naval reactor.

The final test to consider in determining whether a solid waste is a hazardous waste is whether the waste exhibits a hazardous characteristic (i.e., ignitability, corrosivity, toxicity, or reactivity). Only the toxicity test is relevant to spent naval fuel owing to its metallic, solid structure. The toxicity test involves determining whether one or more of a list of toxic substances (e.g., heavy metals) are present in the waste above RCRA concentration limits. The hazardous characteristic tests are to be applied to a representative sample of the waste. Spent naval fuel does not contain any constituents that could cause the fuel to be regulated as a characteristic hazardous waste. Specifically, none of the materials for which toxicity is measured is present in fuel except in trace amounts well below regulatory limits. TCLP analysis of spent naval nuclear fuel has confirmed this determination.

C.4.3 Excess Equipment Combining Heavy Metals

In accordance with the NNPP mixed waste management principles discussed in Section 1.3 of this report, the Program is evaluating options for efficient and cost effective radiological processing of excess equipment containing heavy metals (primarily lead used for shielding purposes) to facilitate mixed waste minimization and recycling of heavy metals. The excess equipment is from the maintenance, overhaul and decommissioning of nuclear powered ships and prototypes that are being removed from active service as a result of the downsizing of the Navy fleet. This equipment is not able to support work on later classes of nuclear-powered ships.

The equipment containing heavy metals identified in Tables C.4 and C.5 typically contains lead shielding which is canned; i.e., enclosed between steel sheets which prevents the lead from coming into contact with radioactivity. The NNPP is considering radiological processing methods for removing the metals containing radioactivity from the non-radioactive heavy metals, which could then be recycled. Table C.4 presents a summary of the excess equipment containing heavy metals currently at each NNPP site. Table C.5 presents a summary by site of the equipment containing heavy metals which is projected to become excess during the next 5 years.

Separating the radioactivity from the nonradioactive recyclable metals will be conducted in accordance with existing Program requirements for radiological work. The Program has over 40 years of experience with decontaminating equipment under stringent radiological controls. Both surface decontamination and mechanical separation methods have been employed. In particular, mechanical separation of equipment by disassembly and cutting is standard craftsmanship for work on nuclear propulsion systems. Such radiological processing to separate radioactive constituents from non-radioactive hazardous constituents is in keeping with the Program's efforts to minimize the generation of mixed waste. Based on engineering evaluations to date, it is projected that radiological processing of excess equipment containing heavy metals will provide over eighty percent reduction in the amount of mixed waste that would otherwise be generated by indirect disposal of the equipment.

Because of the efficiencies gained from economies of scale, the Program expects to use one facility for the radiological processing of excess equipment to remove recyclable heavy metals. Although commercial enterprises are being reviewed for this type of work, it is likely that a Program facility will be used for the majority of the equipment. In that event, the expected amount of potential mixed waste residuals resulting from this work over the next 5 years is 145 m^3 (270,700 kg). The radiation level of such waste would not be of sufficient significance to affect RCRA treatment standards since it could be contact handled; the primary radionuclide is cobalt 60. The hazardous waste codes expected would be D008 (most prevalent), D007, D006, D005 and/or D011. Technology to treat this waste should be consistent with technology needed to treat equivalent solely hazardous waste. Because of uncertainty as to which Program facility would perform the radiological processing, the predicted mixed waste residual volume is not included in the 5-year projections in the Program site specific information. This information will be provided as part of the treatment plan development when a central facility is selected.

C.5 Department of Energy Moratorium Waste

In May 1991, the Department became aware that inconsistent and, in some cases, inappropriate criteria were being used to release hazardous waste for treatment and disposal as nonradioactive waste. To address this problem, DOE imposed a moratorium on the offsite shipment of hazardous waste from areas with a potential for causing radioactive contamination. The moratorium is being lifted on a site-by-site basis contingent on the Headquarters Office of Environmental Restoration and Waste Management approving site procedures invoking current criteria and controls on offsite release of waste.

The current criteria for a waste being declared nonradioactive are:

1) it contains no added radioactivity in bulk or volume from DOE operations, and

2) it exhibits surface contamination at levels less than the guidelines of DOE Order 5400.5, "Radiation Protection of the Public and the Environment."

To date, criteria and procedures have been approved and the moratorium lifted at seven sites. Twenty-two additional sites have submitted procedures for Headquarters review.

Due to the moratorium, DOE sites for which the moratorium is still in effect are storing some wastes that would normally be sent offsite for treatment and disposal as hazardous wastes. In accordance with the moratorium and direction from Headquarters, until the sites' criteria and procedures for declaring that the waste is nonradioactive have been approved, these wastes must be considered suspect. Once the criteria and procedures are approved, it is expected that most of these wastes can be removed from the sites as hazardous waste.

DOE has not included data on this suspect waste in the Inventory Report; however, it is the Department's intention to continue to assess and evaluate this waste. Based on this review, data on any waste confirmed to be mixed will be provided in the final report.

Table C.1 - Disputed Materials Not Categorized As Waste

DOE SITE	SODIUM METAL	DEPLETED URANIUM	
	Metric Tons	# of cylinders	Metric Tons
INEL	238	—	—
Portsmouth	—	10,400	83,200

Table C.2 - Non-Mixed Radioactive Low Level Waste in Storage as of 12/31/92

DOE SITE	ACCUMULATED VOLUME IN STORAGE AS OF 12/31/92 cubic meters	TOTAL GROSS ACTIVITY IN STORAGE AS OF 12/31/92 curies
CALIFORNIA		
Lawrence Berkeley Lab.	362.2	4,934
Lawrence Livermore Natl Lab	463.7	14,116
Sandia Natl Lab - Livermore	48.8	27,454
Stanford Linear Accelerator	52	0.4
COLORADO		
Rocky Flats Plant	2,974	14.7
FLORIDA		
Pinellas	16.4	2,771
IDAHO		
Argonne Natl Lab - West	13.0	52,423
Idaho Natl Engineering Lab	0	0
Naval Reactor Facility	0	0
ILLINOIS		
Argonne Natl Lab - East	929	Not established.
Fermi Natl Accelerator Lab	89.2	88.1
IOWA		
Ames Laboratory	23.1	0.01
KENTUCKY		
Paducah Gaseous Diff. Plant	3,347	6.2
MISSOURI		
Kansas City Plant	9.9	217.1
NEVADA		
Nevada Test Site	Not established.	Not established.
NEW JERSEY		

Table C.2 - Non-Mixed Radioactive Low Level Waste in Storage as of 12/31/92

Princeton Plasma Physics Lab	100	<1
NEW MEXICO		
Inhalation Tox. Research Lab	75	200
Los Alamos National Lab	0	0
Sandia Natl Lab-Albuquerque	160	56.4
NEW YORK		
Brookhaven National Lab	40	1.9
West Valley Demo Project	2,899	345
OHIO		
Fernald (EM-40)	30,050	862
Mound Plant	4,482	7,573
Portsmouth Gaseous Diffusion	29,488	0.97
Reactive Metals, Inc.	2,611	0.3
SOUTH CAROLINA		
Savannah River Site	600	250,000
TENNESSEE		
Oak Ridge K-25 Site	44,304	N/A
Oak Ridge National Lab	2,442	353,608
Oak Ridge Y-12 Plant	17,321	8.6
Oak Ridge Assoc. Univ.	0	0
TEXAS		
Pantex	387	35.7
WASHINGTON		
Hanford	185.5	234,905
TOTAL	150,567	946,005

Revised for SRS and WVDP 4/8/93

Table C.3 - National Summary of Department of Energy Spent Nuclear Fuel[1] On-Site 12/31/92 - in metric tons of initial heavy metal

DOE SITE	PRODUCTION FUEL	R&D FUEL
Idaho National Engineering Lab	—	277
West Valley Site	—	27.6
Savannah River Site	7.2	60.2
Oak Ridge National Laboratory	—	0.6
Hanford Site	2099.2	31.2
Brookhaven National Laboratory	—	0.2
University Reactors	—	0.6
TOTALS	2106.6	397.4

(1) Does not include Spent Naval Nuclear Fuel addressed in Section C.4.2

TABLE C.4
NAVAL NUCLEAR PROPULSION PROGRAM EXCESS EQUIPMENT CONTAINING HEAVY METALS INVENTORY AS OF DECEMBER 31, 1992

State/Site	Inventory (m^3)	Inventory (kg)
California: Mare Island Naval Shipyard	20	19,190
Connecticut: Knolls Atomic Power Laboratory - Windsor Site	0	0
Hawaii: Pearl Harbor Naval Shipyard	0.9	10,000
Idaho: Idaho National Engineering Laboratory: Naval Reactors Facility	16	44,000
Maine: Portsmouth Naval Shipyard	10.7	23,650
New York: Knolls Atomic Power Laboratory - Knolls Site	0	0
Knolls Atomic Power Laboratory - Kesselring Site	0	0
Pennsylvania: Bettis Atomic Power Laboratory	7	25,550
South Carolina: Charleston Naval Shipyard	0	0
Virginia: Norfolk Naval Shipyard	0	0
Washington: Puget Sound Naval Shipyard	0	0
NATIONAL TOTAL:	54.6	122,340

TABLE C.5
NAVAL NUCLEAR PROPULSION PROGRAM PROJECTED AMOUNT OF EQUIPMENT CONTAINING HEAVY METALS EXPECTED TO BECOME EXCESS IN NEXT 5 YEARS

State/Site	Inventory (m^3)	Inventory (kg)
California: Mare Island Naval Shipyard	114	227,300
Connecticut: Knolls Atomic Power Laboratory - Windsor Site	129	134,300
Hawaii: Pearl Harbor Naval Shipyard	0	0
Idaho: Idaho National Engineering Laboratory: Naval Reactors Facility	25	59,000
Maine: Portsmouth Naval Shipyard	34	44,200
New York: Knolls Atomic Power Laboratory - Knolls Site	1.29	6,000
Knolls Atomic Power Laboratory - Kesselring Site	131.4	90,000
Pennsylvania: Bettis Atomic Power Laboratory	3.5	8,800
South Carolina: Charleston Naval Shipyard	1	550
Virginia: Norfolk Naval Shipyard	228	403,000
Washington: Puget Sound Naval Shipyard	25	75,300
NATIONAL TOTAL:	692.2	1,048,450

APPENDIX D

Glossary

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The glossary for the Interim Mixed Waste Inventory Report has not yet been compiled. However, the Final Report will contain a glossary of terms. Until the Final Report is completed, individuals reviewing the document are encourage to utilize existing Department of Energy (DOE) glossaries such as that available in the Department of Energy Environmental Restoration and Waste Management 5-Year Plan. An alternative is to call the Interim Report Hotline (301) 903-7488 for clarification of specific terms. DOE does intend to work with individuals commenting on the report to develop the flossary for the Final Report.