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PACIFIC NORTHWEST LABORATORY
TASKS SUPPORTING THE OFFICE OF TECH-
NOLOGY DEVELOPMENT NATIONAL PROGRAM

S. C. Slate

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Handout

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Pacific Northwest Laboratory
TASKS SUPPORTING THE OFFICE OF TECHNOLOGY
DEVELOPMENT NATIONAL PROGRAM

The purpose of this document is to provide a concise summary of the Pacific Northwest Laboratory's (PNL) tasks being conducted for the Department of Energy's (DOE) Office of Technology Development (OTD). The summaries are useful to principal investigators who want to link their work to others doing similar work, to staff in DOE operating programs who are looking for better solutions to current problems, and to private industry which may be interested in teaming with PNL to commercialize the technology.

The tasks are organized within Hanford's overall Work Breakdown Structure (WBS), which is a hierarchical organization of the Hanford mission into subordinate missions. The technology development tasks are all in WBS 3.2. The first subordinate steps under WBS 3.2 are general categories of technology development, such as Soils and Groundwater Cleanup. The next level is the Integrated Program (IP) and Integrated Demonstration (ID) level. An IP is a centrally managed series of projects which explore and develop a particular technology, such as characterization, for application to a wide spectrum of problems. An ID brings multiple technology systems to bear on an actual problem; for example, a carbon tetrachloride plume migrating through the soil is being remediated with biological agents, heating the soil, and destruction of the contamination in vapor removed from the soil. IDs and IPs are identified by an alphanumeric code: GS02 is the second ID under Groundwater and Soils Cleanup. The final step in the breakout is the Technical Task Plan (TTP). These are individual tasks which support the ID/IP. They are identified by a six-digit number in the format 3211-01. The WBS structure for Technology Development down to the ID/IP level is shown in Figure 1. The TTP summaries include scope, principal investigator, and telephone.

WORK BREAKDOWN STRUCTURE- FY 1993

Figure 1. Technology Development Work Breakdown Structure

PNL OTD TASK SUMMARIES
(FY 1993)

WBS 3.2.1 Groundwater & Soils Cleanup

WBS 3.2.1.1 - GS01 VOC IN NON-ARID SOILS (SAVANNAH RIVER)

3211-01 High Energy Corona for Destruction of VOCs in Process Off-Gas

Field test prototype technology using high energy corona to destroy trichloroethylene (TCE) and perchloroethylene (PCE) in soil off-gas stream and obtain data to project viability on scaleup.
W.O. Heath, 376-0554.

3211-02 Biomolecular Probe Analysis

Characterize techniques that enhance microorganisms likely to metabolize TCE and PCE, and search for microorganisms with the genetic capability to degrade TCE and PCE.
Fred Brockman, 375-2831.

3310-03 Six-Phase Soil Heating for Enhanced Removal of Contaminants

Develop and demonstrate electrical heating to enhance the removal of volatile organic compounds (TCE/PCE) from non-arid soils.
M.H. Schlender, 376-3638.

WBS 3.2.1.2 - GS02 VOC IN ARID SOILS (RICHLAND)

3111-01 Management and Operations of VOC-Arid Integrated Demonstration

Covers all administrative and management functions necessary to oversee work being done by PNL and WHC for the VOC Arid ID. The initial focus of the ID is the Hanford Site 200 West Area carbon tetrachloride contaminated area. The ID will demonstrate, test, and evaluate new technologies for all phase of actual cleanup, including all regulatory and public involvement requirements.
Tom Brouns, 376-7855.

3111-04 Treatment Technologies

Subtask 1: demonstrate in situ remediation of nitrates and CCl_4 by injecting nutrients through a network of wells. Subtask 2: field test six phase electrical soil heating in arid soils for removal of volatile organic compounds (VOC). Subtask 3: destroy VOC in off-gas stream by combining RF or electrical heating with low energy electron beams.
Tom Brouns, 376-7855.
W.O. Heath, 376-0554, (Subtask 2 only).

3211-04 DT&E for Design and Evaluation Technologies

Six subtasks focus on developing and adapting predictive tools for remediation design and performance evaluation supporting the VOC Arid ID.
K.R. Roberson, 376-3514.

3211-05 Characterization and Monitoring Technologies

Subtask 1: provide overall expertise, support, and data fusion to this TTP. Subtask 2: develop a new unsaturated flow apparatus to predict the subsurface migration of VOCs in arid and semi-arid soils. Subtask 3: test and demonstrate a borehole sampler to obtain samples of VOC vapors from specific depths during borehole drilling. Subtask 4: continue testing HaloSnif, a total chlorinated hydrocarbon sensor, as a real-time monitor during drilling operations by integrating the HaloSnif with a cone penetrometer. Subtask 5: evaluate supercritical fluid extraction against conventional technologies for environmental acceptability and cost effectiveness as a site characterization tool.
Stan Tomich, 376-9645.

WBS 3.2.1.3 - GS03 MIXED WASTE LANDFILL

3211-12 On-Site Analysis of Metals in Soils Using ASV

Develop and evaluate test methods based on the use of stripping voltammetry for field screening of sediment samples for selected priority metals.
Khris S. Olsen, 376-4114.

3211-13 In Situ Determination of Radionuclide and Metal Contamination

Design and fabricate in situ sensors to measure radioactivity (with a germanium diode gamma-ray spectrometer) and stable metal contaminants (with x-ray fluorescence) in and around a landfill.
R.L. Brodzinski, 376-3529.

3211-14 Detection and Quantification of High-Z Metals

Use x-ray fluorescence to detect and quantify heavy metals (chromium, mercury, arsenic, lead, cadmium, antimony) in the Sandia mixed-waste landfill.
C.L. Shepard, 375-3675.

WBS 3.2.1.4 - GS03 PLUTONIUM IN SOILS (NEVADA)

3211-09 Pu ID Sample Support

Provide a representative soil sample contaminated with plutonium and/or other heavy metals at the Nevada Test site to evaluate physical separation techniques for soil decontamination.
Jeff Serne, 376-8429.

WBS 3.2.1.5 - GS04 URANIUM IN SOILS (FERNALD)

3211-03 In Situ Mapping of Radionuclides in Subsurface and Surface Soils

Continue development of a beta-gamma scintillation sensor for the quantification of uranium in surface, subsurface and exhumed/washed soils, and a stand-alone, intelligent, in situ gamma spectrometry for monitoring uranium in surface and shallow subsurface soils.
Alan Schilk, 376-9510.

WBS 3.2.1.6 - IP-6 IN-SITU VITRIFICATION (RL)

3012-01 Underground Tank Remediation by In Situ Vittrification

Adapt and develop in situ vittrification technology for the remediation of buried tanks containing hazardous and radioactive wastes, and to transfer the technology to DOE sites of environmental restoration. This task is limited to closeout activities.
John Tixier, 376-8732.

3211-15 ISV Applied Technology

Provide the fundamental research and development required to resolve several technical issues regarding in situ vittrification; completes work begun in FY 1991. This task is limited to closeout activities.
Leo Thompson, 376-5150.

WBS 3.2.1.8 - GS07 CHARACTERIZATION, MONITORING AND SENSOR TECH DEV

3011-02 Defense LLW Technical Support - Lysimeters

Finish laboratory analysis on lysimeters drainage waters, finish tabulation of the chemical, hydrologic & meteorologic data into convenient computer files, begin data analyses by using various source term release conceptual models and document the validation attempt selected.
R. Jeff Serne, 376-8429.

3310-01 Parsons Superfund Site: In Situ Vittrification Data Collection

Collect full-scale operational and performance data during FY 1993 and early FY 1994 on in situ vittrification conducted by Geosafe Corp at the Parsons Superfund Site, Lansing, Michigan, and potentially at some other appropriate sites to be determined.
Ja-Kael Luey, 376-5740.

3310-07 Direct Measurement of SR-90 in Surface Soils

Develop, calibrate, and demonstrate a real-time ⁹⁰Sr analyzer for direct measurements based on the ⁹⁰Y daughter using multi-layer scintillation fiber-optic technology.
Alan Schilk, 376-9510.

WBS 3.2.1.9 - GS08 IN-SITU REMEDIATION TECHNOLOGY DEVELOPMENT

3111-03 In Situ Remediation Integrated Program (RL)

Coordinate activities supporting the In Situ Remediation IP. The IP will develop and manage the R&D activities for in situ remediation technologies for hazardous wastes, radioactive wastes, and mixed wastes in soils, groundwater, and other media at DOE sites.
Mary E. Peterson, 376-8258.

3310-02 Chemically Enhanced Barriers: Chemically Enhanced Barriers to Minimize Contaminant Migration

Identify chemical reagents that can be added to the upstream flow of contaminated groundwater which will cause contaminants to be sequestered in a permeable barrier.
Kirk J. Cantrell, 376-8647.

3310-05 In Situ Redox Manipulation: Enhancement of Contaminant Destruction and Immobilization
Destroy or immobilize contaminants in subsurface water through chemical or biological manipulation of oxidation-reduction potentials.
John S. Fruchter, 376-3937.

3310-06 In Situ Corona for In Situ Treatment of Nonvolatile Organic Contaminants
Perform the necessary R&D to develop a practical technique for decomposing non volatile and bound organic contaminants in soils using gas-phase oxidants that are produced in situ.
Ron Moss, 376-4658.

WBS 3.2.2 Waste Retrieval & Processing

WBS 3.2.2.1 - WR01 BURIED WASTE (IDAHO)

3212-11 Graphite DC Arc Plasma and Glass Melter
Develop a DC graphite-electrode plasma torch and furnace to treat solid, liquid, and off-gas wastes; enhance vitrification process by using the plasma to preheat the input to melters. Work is principally conducted at MIT in conjunction with Electro-Pyrolysis, Inc.
Jeffery E. Surma, 376-4905.

3320-16 Remote Characterization System Demonstration
Develop and demonstrate a telerobotic vehicle to perform geophysical, radiological, and chemical surveys of hazardous waste burial sites.
Gerald A. Sandness, 375-3808.

3320-17 Remote Excavation System Demonstration
Develop and demonstrate a telerobotic excavator with both a front-end loader and a backhoe for remove overburden removal and waste excavation; develop and demonstrate a vehicle tracking system using the Global Positioning System satellites.
Gerald A. Sandness, 375-3808.

WBS 3.2.2.2 - WR02 UNDERGROUND STORAGE TANKS

3212-05 Simulants for Retrieval Tasks: Define UST Waste Simulants and Provide Simulant Recipes to End Effector System Tasks
Prepare simulated tank wastes for use by dislodging and conveyance system development tasks.
Monte R. Elmore, 376-4356.

3212-21 Compact Processing Unit Demonstration: Development, Design and Demonstration of Compact Processing Units for Cesium Removal
Demonstrate the removal of cesium from tank wastes as a pretreatment for vitrification and grouting; this will be done at the tank farm as an alternative to a central processing facility.
William G. Richmond, 376-8195.

- 3320-01 Early Deployment System (EDS) - Robotic Characterization of Underground Storage Tanks**
Develop and deploy a remote characterization system for underground waste storage tanks that will 1) assay the contents of the tank, 2) perform laser range finder mapping, and 3) conduct a topological survey of the waste surface using structured lighting.
David W. Bennett, 375-2159.
- 3320-02 UST-ID Light Duty Utility Arm: Integrations and Sensors**
Provide the LDUA with overall systems integration and develop and demonstrate an effector for the light duty utility arm that will assist in characterization of the waste surface in underground storage tanks.
Chris M. Smith, 375-3915.
- 3320-03 UST: Multi-Functional Scarifier/Conveyer: Design and Development of a Multi-Function Scarifier End Effector with an Integral Conveyance System**
Develop a hydraulic end effector coupled with a pneumatic conveyance system that minimizes water accumulation during retrieval of salt cake, sludge, and viscous liquids from Hanford single shell and other site waste storage tanks; define the mechanisms of scarification and conveyance with respect to waste fracture and dislodging.
Judith A. Bamberger, 375-3898.
- 3320-04 UST: Long Reach Arm-Kinematics**
Develop and analyze computer models of long reach manipulators to evaluate the utility, complexity, and stability of designs before fabrication.
Mark S. Evans, 375-2143.
- 3320-06 UST: Hydraulics Technology: Hydraulics Technology in Support of Tank Waste Dislodging and Conveyance Systems Development**
Coordinate the multi-program, multi-laboratory efforts to develop dislodging and conveyance systems for salt cake and sludge wastes.
Mike R. Powell, 376-2234.
- 3320-11 UST: Tank Waste Processing Analysis**
Assess the spectrum of processes and compact processing units that would be required for pretreatment of Hanford wastes.
Eddie G. Baker, 376-1494.

WBS 3.2.2.3 - WR03 DECONTAMINATION & DECOMMISSIONING OF FACILITIES ID

Currently, no PNL TTPs.

WBS 3.2.2.4 - WR04 EFFICIENT SEPARATIONS

- 3212-04 Innovative Chemical Separations/Treatment**
Identify, develop, and test new solid-based chemical separations/treatment options to treat radioactive and hazardous wastes, focussing on cesium, strontium and transuranics initially.
Dennis Wester, 376-4522.

3212-15 Technology Evaluation and Process Definition - Unit Process Level
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.
William L. Kuhn, 376-0458.

3217-01 Development of High Capacity Selective Fixed Sequestering Agents: A Collaborative Effort with Industry and University Participants to Develop Extractants for Treating Nuclear Wastes
Develop high-capacity selective solid extractants for cesium, strontium, chromium, silver, and noble metals from nuclear wastes.
Dennis Wester, 376-4522.

3320-08 Efficient Separations/Processes Integrated Program (ESPIP)- Coordination, Program Development and Technology Evaluation Tasks
Provide separations and waste-form technologies and processes to process and immobilize a wide spectrum of radioactive and hazardous defense wastes; transfer technology to US industry; explore uses of separated radionuclides; coordinate technologies and processes within DOE.
William L. Kuhn, 376-0458.

3320-15 Selective Leaching of Tank Sludges by the ACT*DE*CON Process
Assess the ability of Bradtec's proprietary ACT*DE*CON process to treat and recover various radionuclides from waste sludge.
John G.H. Geeting, 372-1060.

3320-18 Alkaline Tank Sludge Treatment Project
Understand the chemical composition and behavior of high-level waste tank sludges and develop methods to separate radionuclides from nonradioactive components of alkaline sludges.
Greg Lumetta, 376-6911.

WBS 3.2.2.5 - WR05 HAZARDOUS & MIXED WASTE DESTRUCTION

3212-01 PNL Specification for MWIP
Provide PNL personnel and resources available to MWIP to participate in technical specification groups and other development efforts.
Wayne A. Ross, 376-3644.

3320-09 Mixed Waste Vitrification Process Limits
Test mixed and low-level waste vitrification technologies for application at Rocky Flats.
Richard D. Peters, 376-4579.

3320-12 Waste Form Performance Criteria and Testing/Evaluation Methods for Mixed Waste IP
Develop criteria to evaluate final waste forms in environmental, technical, regulatory, and economic terms.
Richard D. Peters, 376-4579.

3320-13 EIX Nitrate Destruction: Nitrate/Nitrite Destruction by Electrochemical Ion Exchange
Assess nitrate destruction processes; develop electrochemical ion exchange and destruction processes for nitrate.
Dean E. Kurath, 376-6752.

3320-14 Magnetic and Nonmagnetic Melt/Slag Treatment of Mixed Wastes
Develop technology to remove contaminating corrosion products, regulated materials and radionuclides from ferrous and non-ferrous metals through melting processes that concentrate the contaminants in the slag.
Hurshal G. Powers, 376-4973.

WBS 3.2.2.6 - WR06 ROCKY FLATS FFCA COMPLIANCE

3012-04 PNL Support for EG&G/RF/NMWP Mediated Electrolytic Oxidation
Evaluate mediated electrolytic oxidation as an alternative to incineration for Rocky Flats combustible low-level mixed waste forms and waste streams.
Jeff E. Surma, 375-3903.

WBS 3.2.3 Waste Minimization & Avoidance

WBS 3.2.3.3 - WM03 DOE/AF MOA

3330-01 MOU-USAF MOU - Waste Acid Detoxification and Reclamation (WADR) of Metals
Design, demonstrate, and install a prototypic WADR system to remove metals and recover reusable acid from waste acids for DOE, industrial, and USAF applications.
Evan O. Jones, 372-0662.

WBS 3.2.5 Supporting Technologies

WBS 3.2.5.1 - AL01 ANALYTICAL LABORATORY

3131-01 Analytical Laboratory Mgmt - Methods Compendium Development
Assemble and continue to update a validated compendium of sampling and analytical chemistry methods for ER and WM operations across the DOE complex.
Steven C. Goheen, 376-3286.

3231-01 Data Quality Objective Training and Support
Support demonstrations of the streamlined approach for environmental restoration (SAFER) and train staff at DOE facilities in the use of SAFER; the focus for FY 1993 is SAFER support at Savannah River.
Brent A. Pulsipher, 375-3989.

WBS 3.2.5.2 - DS01 DECISION SUPPORT

Currently no PNL TTPs.

WBS 3.2.5.4 - LC01 LIAISON & COMMUNICATIONS

3270-01 Tribal Relations

Resolve on-going transportation planning and operational issues affecting rights and concerns of American Indian tribes whose jurisdictions are crossed or adjacent to DOE transportation corridors. Edward Libow, (206) 528-3311.

WBS 3.2.5.5 - R001 ROBOTICS

3132-01 Robotics Contaminant Analysis Automation

Develop automated analytical chemistry characterization methods and instruments in support of national DOE site remediation. Michael G. Dodson, 375-2039.

3132-02 Robotics UST

Demonstration, testing, and evaluation in three subtasks: 1) improved manipulator dynamic/kinematic performance for definition of waste retrieval manipulator, 2) improved sensing for teleoperated manipulators, and 3) cost reduction and a safer working environment. David W. Bennett, 375-3903.

3132-03 Robotics Buried Waste

Develop a low signature vehicle incorporating remote control, magnetometers, and remote characterization systems (ground penetrating radar, laser range finder-based recognition of dig-face objects). David W. Bennett, 375-3903.

3132-05 Robotics Cross-Cutting and Advanced Technology

Improve characterization by developing subsurface mapping (ground penetrating radar, acoustics, magnetometry, metal detection); improve sensing of robot manipulator forces and torques to enhance servo control and structural damping. David W. Bennett, 375-3903.

WBS 3.2.7 Technology Integration & Environmental Education

WBS 3.2.7.1 - IT01 INTERNATIONAL TECHNOLOGY EXCHANGE

3233-01 International Information and Activity Support

Collect, evaluate, and disseminate international environmental restoration, waste management, and decommissioning information; support EM's international activities with multinational organizations. Sue J. Mitchell, 375-6479.

3233-02 International Environmental Assessment

Develop an assessment of the geohydrology, contamination, and contaminant migration at international waste management complexes to provide a baseline for data evaluation and future cooperative efforts. Don J. Bradley, 376-2796.

3343-01 Russian Training Program

Develop and implement a 10 day training course on environmental restoration and waste management topics for Russian decision makers.

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Ann Lesperance, 376-9166.

WBS 3.2.7.2 - TI01 TECHNOLOGY INTEGRATION

3241-05 Public Participation Training

Increase DOE HQ staff knowledge and awareness of effective public participation, and facilitate the ability of HQ and field staff to do public participation planning across traditional organizational lines.
William E. Fallon, 646-7787.

3341-01 Technology Integration Support to the IDs and IPs

Integrate the technology needs of IDs and IPs at Hanford, and provide a link to regional and national industry to provide an incentive to industry to work toward our goals.

Erik J. Sterehjem, 376-7036.

3341-02 Transition of ProTech to Full National Implementation

Transition the prototype ProTech system to a national system. ProTech is a communication system that describes innovative technologies to informed stakeholders. ProTech provides fact sheets and compares innovative technologies to their established baselines. Customized versions of ProTech for individual IDs will be created and tested during FY 1994 and if found helpful will be merged into a national system in FY 1995.

Gretchen H. McCabe, (206) 528-3338.

WBS 3.2.7.3 - ED01 ENVIRONMENTAL EDUCATION & DEVELOPMENT

3142-02 RL Manpower Assessment

Promote the development, retaining, and retraining of DOE's work force for the full implementation of the environmental restoration and waste management mission, especially during the transition from the defense weapons production mission.

Robert E. Lewis, 376-4744.

3242-02 OPTIONS in Science: OPTIONS in Science, Engineering and Technology

Stimulate a continual flow of new, well-prepared, highly-creative scientists, engineers, and technical staff equipped and able to participate in environmental restoration and waste management.

Irene Hays, 375-2584.

WBS 3.2.8 Technology Development Support

WBS 3.2.8.2 - PS PROGRAM SUPPORT

3150-01 TPM-Detailee Support

Operate the PNL office supporting Office of Technology Development (EM-50) tasks; provide PNL staff detailees to EM-50 and provide principal EM-50 program links to site operating programs.
Steven C. Slate, 375-3903.

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