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Department of Energy
Albuquerque Operations Office
Los Alamos Area Office
Los Alamos, New Mexico 87544

JUL 10 1997

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

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Mr. Benito J. Garcia, Bureau Chief
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
2044 Galisteo Street, Building A
P. O. Box 26110
Santa Fe, NM 87505

Dear Mr. Garcia:

Subject: Treatability Study Notification

The purpose of this letter is to provide notification of intent to conduct one mixed waste treatability study at Los Alamos National Laboratory (LANL), pursuant to Title 20 of the New Mexico Administrative Code, Chapter 4, Part 1, which incorporates 40 CFR 261.4(f). The study will be conducted by the Environmental Science and Waste Technology Group (CST-7). The waste sample to be studied is radioactively contaminated shrapnel containing lead generated during environmental restoration work at Technical Area (TA) 33. The shrapnel originated from implosion tests conducted between 1950 and 1956. This waste stream is not covered by the Compliance Plan Volume of LANL's Federal Facility Compliance Order Site Treatment Plan because it is newly-generated waste. A total of 200 kilograms of mixed waste sample will be treated in this study.

This treatability study is intended to determine whether radioactively contaminated shrapnel containing lead is amenable to decontamination using an electrochemical process and will determine the efficiency of the decontamination process. The study will be conducted at TA-48.

If you have any questions, please contact me at (505) 665-5042.

Sincerely,

H. L. "Jody" Plum
Office of Environment and Projects

LAAMEP:3JP-047

Enclosure:
Treatability Study Process Description,
Electrochemical Decontamination of the
Surface of a Lead Alloy

cc:
See page 2

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JUL 10 1997

cc w/enclosure:
Robert S. (Stu) Dinwiddie, Ph.D., Manager
RCRA Permits Management Program
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
2044 Galisteo Street, Building A
P. O. Box 26110
Santa Fe, NM 87505

ENCLOSURE

TREATABILITY STUDY PROCESS DESCRIPTION,

ELECTROCHEMICAL DECONTAMINATION OF THE SURFACE OF A LEAD ALLOY

Facility Name:	Los Alamos National Laboratory (LANL), Chemical Science & Technology Division, Environmental Science & Waste Technology Group (CST-7)
Facility EPA ID Number:	NM0890010515
Project Title:	Electrochemical Decontamination of the Surface of a Lead Alloy.
Project Contact:	Jacek Dziewinski, LANL; CST-7 Mail Stop J514 (505)667-9792 FAX (505)665-4955
Other Contacts:	Stanislaw Marczak, LANL; CST-7 Mail Stop J514 (505)667-4487 FAX (505) 665-4955 Jennifer Murphy, LANL, CST-7 Mail Stop J514 (505)665-0618 FAX (505) 665-4955

Project Description:

This project will consist of one (1) treatability study involving mixed waste (radioactively contaminated shrapnel containing lead) generated during the environmental restoration work at LANL's Technical Area (TA)-33. This project is intended to separate the radioactive contaminant (uranium) from the shrapnel. The project will determine whether radioactively contaminated shrapnel containing lead is amenable to decontamination using electrochemical processing and will determine the efficiency of the decontamination process.

Treatability Study Objectives:

Objectives for this treatability study are as follows:

1.) Demonstrate the feasibility and advantage of electrolytic treatment as an effective, safe, and economical method for mixed waste metal decontamination and recycling.

2.) Obtain experimental data on the optimal conditions, and material compatibility for electrolytic treatment of radioactively contaminated shrapnel containing lead.

3.) Establish electrolytic decontamination as an effective method of pretreatment for mixed waste metal. If the method is effective, it will allow recycling as an alternative to disposal of mixed waste.

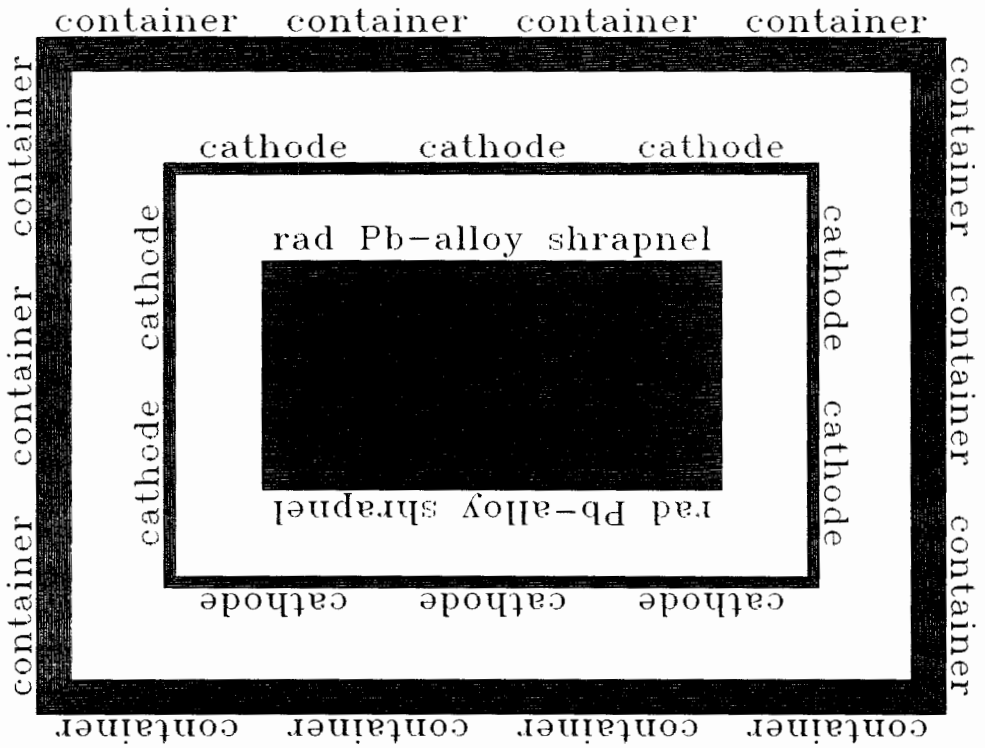

Figure 1. Schematic diagram of electrolytic decontamination.

Project Tasks:

1. Build a large cell that accommodates numerous shapes and sizes of shrapnel.

2. Transport mixed waste from TA-33 to TA-48 according to DOT standards.

3. Analyze samples of the waste.

4. Conduct the treatability study to find optimal conditions for surface decontamination of the lead alloy. Conditions include: selection of metal for the cathode, selection of electrolyte, selection of optimal amperage, voltage, and exposure time period.

5. Measure the radioactivity of the decontaminated metals and make a determination of whether they can be free-released. LANL's Environmental Safety and Health Group

(ESH-1) makes such determination in accordance with DOE Order 5400.5 "Radiation Protection of the Public and the Environment."

6. Release the metals for reclamation.

7. Analyze and characterize the secondary waste.

8. Dispose of the secondary waste as appropriate.

Project Milestones:

The start date will be a minimum of 45 days after submittal of the treatability study notification to NMED.

Qualifications:

Our team has many years of diversified experience in chemical engineering and chemistry, including radiochemistry and environmental chemistry. In addition to other projects, we have developed electrochemical systems for recovery of nitric acid from plutonium waste, developed a treatment for water-reactive mixed waste, modified industrial processes, and developed new analytical procedures. Our team has recently completed studies on waste from different Site Treatment Plan (STP) treatability groups using this technology to successfully treat the hazardous waste components of the mixed wastes. Our experience treating these mixed wastes has allowed us to understand what precautions to take, what procedures are necessary, and how to analyse and manage the mixed waste.

Key Staff: Jacek Dziewinski
Education: M.Sc. Chemical Process Engineering.
Experience: 15 years of industrial and scientific experience, including 5 years of industrial research experience, University of Mining and Metallurgy (mass, heat exchange, reaction kinetics, adsorption), 6 years of industrial operations experience as Senior Process Engineer, BRZ Corporation (electrochemical processes, extractive metallurgy), and 4 years with LANL, Principal Investigator (environmental projects).

Stanislaw Marczak
Education: Ph.D. Inorganic Chemistry and Electrochemistry
Experience: Chemical analysis (spectral and electrochemical), transition metals chemistry (separation, complex compounds), mechanisms of electrode reactions, chemical and electrochemical kinetics, 8 years Warsaw University, 3 years with LANL.

Equipment and Facilities:

The tests will be performed in a radiation controlled room equipped with appropriate monitoring and ventilation systems, and a drain to the Radioactive Liquid Waste Treatment Facility collection system. A Radiological Control Technician will be available on call as required by the regulations. The metal waste will be placed in an electrolytic bath connected to a Dynatronix DPR20-100-400 power supply. The auxiliary equipment will include pumps, pH meters, thermometers, and a chart recorder.

Project Discussion:

Description of Waste to be Treated: Mixed waste is defined as any waste containing both hazardous and radioactive constituents. The waste to be treated is radioactive shrapnel containing lead generated during environmental restoration work at TA-33. The shrapnel originated from implosion tests conducted between 1950 and 1956. The pieces of shrapnel are surface contaminated with radioactivity. Uranium was the only radioactive material used at South Site that could have contaminated the shrapnel.

Sample Waste Amount to be Treated: 200 kg

RCRA Waste Code: D008 (lead)

Site Treatment Plan Information: This waste stream is not covered by the Compliance Plan Volume of LANL's Federal Facility Compliance Order Site Treatment Plan because it is newly generated waste.

Description of the Waste Treatment Technology: Electrochemical processing will be used to decontaminate the shrapnel containing lead. Metal pieces will be placed in a tub having about 50 L volume. The tub will be filled with an electrolyte. Aqueous solution of acetic acid will be used as the electrolyte for lead alloy decontamination. Electric contact will be made between the metal pieces. The pieces will be surrounded by counter electrodes. Low voltage direct electric current (DC) will be connected to the metal pieces and the counterelectrodes (refer to figure 1). The decontaminated pieces will be made anodic (+) and the counterelectrodes cathodic (-). The typical current will be between 20 - 100 A, and the voltage will be between 2 - 15 V. As a result of the current flow the metal will be dissolving into the solution according to: $M = M^{+n} + ne^-$. The dissolved metal ions will migrate towards the cathodes, where they will be deposited according to: $M^{+n} + ne^- = M$. This way layers of external surface of the shrapnel pieces will be removed. The radioactive contamination (uranium) will be removed with these layers. The contamination will not be redeposited on cathodes because uranium does not easily plate.

The electrolysis will continue until radioactive contamination is removed from the metal surface to background level. The decontaminated metal alloy will be free-released, provided it meets the appropriate criteria. DOE Order 5400.5 specifies free-release

criteria and procedures. Laboratory Procedure (LP)107-04.1 "Releasing Materials and Equipment" implements the requirements of DOE order 5400.5 and is more stringent than the DOE order. The Laboratory will comply with LP107-04.1 to ensure appropriate release of recovered metals.

Waste Management: The spent electrolyte solution will contain low-level radioactivity. This solution will be analyzed by SW-846, Method 6010 (Inductively Coupled Plasma Atomic Emission Spectroscopy) to ensure that no regulated hazardous waste constituents remain (i.e., lead). Analytical results will be used to profile the liquid effluent, which will then be submitted to the Environmental Management (EM) Division, Solid Waste Operations Group for classification by Waste Services. The Environmental Management Division, Radioactive Liquid Waste (EM-RLW) Group will compare the approved waste profile form with its waste acceptance criteria (WAC). If the profiled waste effluent meets the facility's WAC, EM-RLW will approve the discharge prior to disposal into LANL's Radioactive Liquid Waste Treatment Facility. If the effluent does not meet the WAC, it will be managed as low-level liquid mixed waste and stored appropriately.

Recovered metal pieces will be monitored for radioactive contamination. It is expected that the metal will comply with the free-release criteria after treatment. When the metal is adequately treated to meet the free-release criteria, it will be reclaimed. If the radioactive contamination is not sufficiently removed from the metal objects, they will be returned to the process. Should the treatment fail to decontaminate the metal to background levels the metal pieces will be managed and disposed of as mixed waste.