BNWL-1836
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PACIFIC NORTHWEST LABORATORY
MONTHLY ACTIVITIES REPORT
MAY 1974

Division of Production and Materials
Management and Hanford Plant
Assistance Programs

Battelle

Pacific Northwest Laboratories
Richland, Washington 99352

JUNE 1974

Prepared for the U.S. Atomic Energy
Commission under Contract AT(45-1):1830

BNWL-1836

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PACIFIC NORTHWEST LABORATORY
operated by
BATTELLE
for the
U.S. ATOMIC ENERGY COMMISSION
Under Contract AT(45-1)-1830

Printed in the United States of America
Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151
Price: Printed Copy \$4.00; Microfiche \$1.45

(Special Distribution)

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MAY 1974

Division of Production and Materials Management
and
Hanford Plant Assistance
Programs

by the

Staff of Battelle-Northwest
E. L. Alpen, Director

June 1974

BATTELLE
PACIFIC NORTHWEST LABORATORY
RICHLAND, WASHINGTON 99352

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PACIFIC NORTHWEST LABORATORY
MONTHLY ACTIVITIES REPORT
DIVISION OF PRODUCTION AND MATERIALS MANAGEMENT
AND HANFORD PLANT ASSISTANCE PROGRAMS
ASSISTANCE TO ATLANTIC RICHFIELD HANFORD COMPANY

Summary

PROCESS DEVELOPMENT - RESEARCH DEPARTMENT

Plutonium Scrap Processing Development

Flaming and eruption of the fusion mixture from the container again occurred during a laboratory-scale test of the Na_2O_2 -NaOH fusion process for recovering Pu from incinerator ashes.

PROCESS TECHNOLOGY -RESEARCH DEPARTMENT

Plutonium Trench Soil Characteristics

Chemical attack on sediment mineral fragments from the 216-A-1A tile field is being investigated by electron microprobe techniques.

Waste Solidification and Encapsulation

Further equipment and process modifications were tested toward improved CsCl and SrF_2 encapsulation.

Tank Farm Support

Soil samples selected from well cores in the S, T, TX, B, and A tank dry wells and some from backfill material are being characterized as to their hydraulic properties.

A series of instrumentation systems for detecting leaks in waste storage tanks was evaluated during a field test conducted in the 200-West Area.

Portland cement injection grouts were used in an ARHCO conducted test of a procedure for sealing the well casing-soil interface along monitoring wells. Data on transmission of injection pressure through the soil were obtained for analysis.

Prevention of Accidental Releases

- Surficial Contamination and Airborne Release Studies

Initial results indicate fractional airborne release of Cs-137 during the heating of contaminated surface materials is less than one percent.

From 6.4 to 34 percent of the Cs-137 activity present was airborne when contaminated soil was dusted into air flowing through the 242-B wind tunnel at 3 to 20 mph.

Surface materials were collected from various plots to characterize the distribution of radionuclides in the area around U-Pond.

Large volume air samplers were removed for radiochemical analysis from the upwind and 100-foot downwind towers of U-Area.

Aircraft concentration measurements of SF₆ plumes out to 65 km were compared with concentrations from a diffusion model. The comparisons indicated the model to be doing well in the area of downwind dilution, but needing adjustment of some parameters to correctly predict the magnitude of instantaneous samples.

Temperature data from the 122-meter meteorological tower are undergoing analysis for conditions favorable for dust devil formation. A temporary observing program for dust devils has been initiated and will continue through June. A technical document on dust devils as related to Hanford operations is being prepared.

- Groundwater Management Studies

Quarterly water elevation measurements in the Hanford wells have been completed. Water level data gathered during the past six months is being added to the computer well hydrograph file.

The Variable Thickness Transient Model Computer Code is now running on the PDP-11/45 and comparisons of output with the CYBER-74 is planned.

The basic framework for the expanded information retrieval system on the PDP-11/45 has been completed.

After five column volumes, less than one percent breakthrough of Sr and Cs occurred in studies on decontamination of a waste condensate by a soil column.

Work continued to find a method for reducing the number of Kd measurements required to predict sorption by soil in the PERCOL and transport models.

- Biological Transport Studies

In conjunction with a plant and animal census site study, physical properties and fertility status are being determined on samples of surface soils from near the B-C crib and the Redox pond areas.

Deposition of transuranic elements in rats was about the same when the rats were fed tumbleweed grown on soil contaminated with transuranic element nitrate solution as when the contaminating solution also contained the chelating agent DTPA.

PROCESS TECHNOLOGY - DEVELOPMENT ENGINEERING DEPARTMENT

Storage of High-Level Liquid Radioactive Waste

For studies on cathodic protection of underground waste tank liners, equipment is being assembled to determine current distribution as a function of anode placement and solution conductivity.

A laboratory prepared solidified waste (15% H_2O ; 0-2.5% NO_2^- ; 60°C) corroded mild steel at rates from 12 to 18 mils/year. The reason for this relatively rapid attack on mild steel by solidified waste is not apparent.

The ultrasonic "point probe" tank inspection system is being evaluated and refined to improve crack detection capability. Laboratory results are very encouraging.

In tank leak model studies, a first case flow model of the near-field soil is operable on the CYBER computer.

The engineering audit of the FIC system is nearly completed and a final report is currently being prepared.

A breadboard ultrasonic logging system for liquid level detection and waste characterization is currently being assembled for installation in a waste tank to obtain field data and experience. Electronic instrumentation for the field system has been assembled and work is currently underway on the transducers and probe positioning device.

Tests on an RF impedance liquid level detection system disclosed a cyclic variation in output due to the particular temperature control system used. Redesign of the system appears necessary for improved performance.

A cooperative ARHCO, BNW, Boeing Company proof-of-principle field test was completed in which leak detection methods based on changes in soil transmissivity and soil dielectric characteristics exhibited the capability to detect small quantities of fluids injected into selected test site well casings.

ASSISTANCE TO ATLANTIC RICHFIELD HANFORD COMPANY

PROCESS DEVELOPMENT - RESEARCH DEPARTMENT

Plutonium Scrap Processing Development

Recovery of Plutonium from Incinerator Ashes
(J. A. Partridge, Chemical Development Section)

Six tests of the experimental $\text{NaOH-Na}_2\text{O}_2$ fusion technique were made during May to determine the recovery of Pu from incinerator ash. Two tests were with regular ash and four were with "processed" or acid-leached ash. Analytical data for the runs are not yet available.

Flaming of the ash occurred again during these runs. In one test involving leached ash the $\text{Na}_2\text{O}_2/\text{NaOH}$ weight ratio was 2:1 rather than the usual 1:1 and the melt to ash weight ratio was 1.5:1. As the temperature was increased at the start of the run, the mixture ignited. Some ash was lost from the fusion container and the test was terminated.

PROCESS TECHNOLOGY - RESEARCH DEPARTMENT

Plutonium Trench Soil Characteristics

Characterization of 216-Z-1A Tile Field Sediments
(L. L. Ames, Water and Waste Management Section)

Alteration or chemical attack of sediment mineral fragments is under investigation with the electron microprobe. Several instances of mineral alteration were found in the autoradiographical and optical study reported last month. The zones of alteration are being scanned for several elements including sodium, calcium, potassium and aluminum, and compared to adjacent unaltered areas to determine elements added to or subtracted from zones of alteration. The location of americium and plutonium in relation to zones of alteration was previously established by autoradiography.

Waste Solidification and Encapsulation

Cs and Sr Encapsulation

(B. Norton, Chemical Development Section)

A series of CsCl capsule leak tests was made to determine if the helium saturated pellet actually did contain helium after the final encasement. The results indicate that leaks may be detected under favorable conditions which appear to depend on the pellet fill method. Methods to fill the porous sintered pellet which will result in positive ability to detect leaks in the capsule are under study. A backfill method is being evaluated.

A new head for the existing SrF_2 crusher is being fabricated and will be tested when completed. Variation in the sintered material made modification of the crushing process necessary. A self-heating insulated container for drying SrF_2 will be fabricated and tested in the coming month.

Tank Farm Support

(S. J. Phillips, Water and Land Resources Section)

Sediment samples from well cores from the S, T, TX, B and A tank farms are being analyzed. Analyses include (1) hydraulic conductivity, (2) relative hydraulic conductivity versus capillary pressure, (3) relative hydraulic conductivity versus percent saturation, (4) capillary pressure versus percent saturation, (5) porosity, (6) bulk density and (7) particle density.

Injection Grouting Around Monitoring Well Casings

(P. L. Koehmstedt, Corrosion Research and Engineering Section)

A concept for sealing soil-well casing interfaces around monitoring wells is being studied. The concept involves perforating existing casings at desired locations, inserting an inner casing with bottom seal, and pressure injecting of a high-pH stable grout to fill voids and bond the casing and soil.

ARHCO conducted a field test near 100-F Area to determine pressure in soil as a function of distance during grouting operation. Portland cement grouts were employed in all tests. BNW recorded soil and well-head pressure data using calibrated pressure transducer systems. A draft report describing measurement systems, calibration procedures and data obtained was prepared and forwarded to ARHCO for review. Mathematical treatment of the test data

to establish the experimental pressure attenuation relationship will be completed for the final report.

Core samples taken from the three-foot (casing to transducer) injection test site are being analyzed for Ca content to determine cement grout egression.

Cement and asphalt emulsion grout specimens tagged with Cs-137 were cast and encapsulated in epoxy resin. One end was machined to provide a known surface area to expose to simulated waste solution for long-term leach tests.

Meteorological and Environmental Surveillance Instrumentation (O. H. Koski, Chemical Development Section)

The intensive properties of the domain external to a waste tank which might provide a basis for leak detection include pH, oxidation-reduction potential, dielectric constant as well as others. An attempt was made to choose those instruments which could, during the course of a field experiment conducted in the 200 West Area, provide data which would be useful in the design of a tank leak surveillance system.

An array of probes consisting of steel, aluminum and antimony was used for determining if pointwise detection of a caustic leak could be made. Addition of caustic to the first gallon of the 3M NaNO₃ solution used provided about a 900 millivolt change in the iron-to-aluminum couple and about 450 millivolts for the iron-antimony couple.

Evaluation of an rf impedance instrument, a vector impedance meter and an impedance bridge with 1000 Hz excitation was made. Of these, the 1000 Hz bridge was found to provide the most useful data.

A leak at a monitored well changed the monitored well to peripheral well impedance by a factor of about 50 percent during the course of the experiment. A one-gallon leak was detectable with the general response being characterized by a decreasing sensitivity according to a relationship of the form $\log Q = -kR + c = kC_1 + C_2$ where Q = leaked quantity, R is resistance in ohms and C_1 is capacitance in nanofarads. Capacitance change was in the order of 30 to 80 nanofarads over the same experiment with additional monitored well-to-peripheral well capacitance increasing with the quantity added.

Prevention of Accidental Releases

- Surficial Contamination and Airborne Release Studies

B-C Crib Studies

(J. Mishima and L. C. Schwendiman, Particulate and Gaseous Waste Research Section)

Potential Airborne Release of Surface Contaminated Materials by Heating

The results of Cs-137 measurements on samples generated in the first seven experiments to determine fractional airborne release of radionuclides during the heating of contaminated surface materials have been received. The four types of contaminated surface materials -- vegetation, organic litter, animal feces and soil -- were placed in a shallow stainless-steel tray and heated to 200°C. A slow current of air was drawn around and over the heated material and passed through a water-filled gas washing bottle followed by a glass fiber filter. The scrubber solution and the filter were analyzed for Cs-137. The fractional release as judged by the filter and scrubber samples was less than the detection limit, which ranged from 0.001 to about 1 percent, depending upon the amount of Cs-137 present in the initial material, the counting time and sample preparation.

Airborn Suspension at B-C Crib Soil

Pre-characterized contaminated soil, collected from the B-C controlled area, was dusted into air drawn through the 242-B Building wind-tunnel at 3.2, 10.4, 15.2, and 20 mph. Air velocity measurements were made on the centerline of the duct. The mass and size distribution of the particles airborne in the wind tunnel and at the exhaust outlet at the top of the Radioactive Aerosol Release Tank were measured. Important conclusions from the results to date are the following:

- The fraction of soil which is carried from the insertion point to the exhaust point of the large tank increased progressively from about 2 percent to 11 percent when the air velocity in the air tunnel was increased from 3 to 20 mph. The geometry of the system is such that the soil airborne at the tank exhaust is a reasonably persistent cloud of particles with an aerodynamic median diameter which ranged from 5 to about 10 μm .
- The fraction of active material airborne at the tank exhaust was 3 to 5 times greater (6 to 34%) than the fraction of soil airborne in the same flow regime. This is important since the observation supports earlier findings that the radioactive constituents are associated largely with the fine fraction of the soil.

Safety Analysis of B-C Crib Contamination

Investigation continued to determine if contaminated material will constitute a downwind airborne hazard. Actual contamination levels and realistic resuspension factors are being employed in computer models which determine downwind concentrations from the extended source description. Hanford meteorological synoptic and field experimental data are being organized for the required inputs to these models.

U-Pond Contamination Studies

(J. Mishima and L. C. Schwendiman, Particulate and Gaseous Waste Research Section)

Several surface samples 1 m² x 1 cm deep were collected to determine if radionuclides are present in the contaminated soil surrounding the U-Pond. Surface materials will be segregated and analyzed by soil fraction.

Resuspension from Contaminated Surfaces -- Field Studies

(G. A. Sehmel, F. D. Lloyd and L. C. Schwendiman, Particulate and Gaseous Waste Research Section)

The first resuspension experiment at U-Area using the 100-foot downwind tower was completed. Samples were removed from both the upwind and downwind

towers and are being weighed before radiochemical analyses. In this experiment, airborne material was sampled as a function of wind speed, direction, and height above ground. A similar experiment at B-C Area was terminated when it was observed that the wind direction controller was not operating properly. The controller has been returned for redesign. Data analysis of radiochemical results is continuing.

Wind Trajectory Studies

(L. L. Wendell and W. F. Sandusky, Atmospheric Physics Section)

The computer model which approximates a plume from a continuous release by integrating a series of independent puffs was modified to produce samples along "prescribed" paths similar to those obtained by an aircraft. Comparisons were made of concentrations from the model with SF₆ plume concentrations measured aboard the Battelle aircraft to distances up to 65 km. The plume dilution downwind compared favorably but the measured concentrations were higher by as much as an order of magnitude than the concentrations produced by the model. The major reason for this appears to be the fact that the aircraft-measured concentrations are instantaneous and the empirical parameters in the model are derived for time averaged quantities which obviously will be lower.

The previous samples obtained by the aircraft were during neutral and unstable conditions. Preparations are underway to obtain some samples under stable conditions.

Work has been initiated to derive, from the trajectory plotting program, a version which will produce a motion picture of the transport over the Hanford site. This will be accomplished with the new microfilm plotting equipment acquired by CSC.

Current telemetry data are now being punched on cards for editing and use in ongoing transport studies.

Significance of Dust Devils and Other Anomalous Winds

(M. M. Orgill and L. C. Schwendiman, Particulate and Gaseous Waste Research Section)

This study is undertaken to determine the potential seriousness from a resuspension standpoint, of dust devils and other unusual wind conditions.

We are continuing our analysis of the temperature data from the 122-meter meteorological tower for the lapse between 0.9 m and 15 m for several years for the months of April through October. At the present time, we are investigating the relationship of the unstable lapse rates (conditions favorable for dust devils) to wind direction and speed in order to ascertain dominant direction in which dust devils may be transported.

A temporary observing program for dust devils has been initiated. This will continue through June as a pilot study, but we hope it can continue through the summer on a more technical basis.

A technical document concerning dust devils and their significance in relation to the Hanford operations is being prepared.

- Groundwater Management Studies

- Groundwater Model Simulation and Verification

- (K. L. Kipp and A. E. Reisenauer, Water and Land Resources Systems Section)

- Water level measurements taken during the last six months are being added to the well hydrograph file in preparation for producing the January 1974 water table map. The July 1973 data will also be contained and that map prepared.

- A June 1974 revision of the well location map for the Hanford Reservation is being drafted.

- The PDP 11/45 version of the Variable Thickness Transient Model is operative. Runs to duplicate part of the latest verification have been started for comparative purposes.

- Data Storage and Retrieval System

- (D. R. Friedrichs, S. W. Ahlstrom and D. D. Hostetler, Water and Land Resources Systems Section)

- The basic framework of the expanded information retrieval system based on the PDP 11/45 disk has been completed and is operative for the well hydrograph data. The historical contamination data file is nearing completion. This new framework will permit these data to be retrieved on the planned ARHCO video terminal.

Field Measurements and Monitoring Assistance

(K. L. Kipp and A. E. Reisenauer, Water and Land Resources Systems Section)

The quarterly water level measurements in the Hanford Reservation wells has been completed.

Moisture content of the soils in the lysimeters was monitored with the neutron probe on April 30 and again on May 14 and 15, 1974.

Well Maintenance

(K. L. Kipp and D. A. Myers, Water and Land Resources Systems Section)

Well maintenance work to upgrade the monitoring program continues. Twelve wells have been cleaned out and reperforated.

Soil Waste Reactions

(R. J. Serne, Water and Waste Management Section)

A laboratory soil column study was continued to measure the decontamination of a B-Plant condensate waste by reaction with the soil. Two laboratory columns are being run with the actual waste. After five column volumes, less than one percent of the Sr and Cs has broken through the column. Twice weekly samples of the waste are being taken and will be characterized.

A study was continued to find a method of reducing the number of sorption measurements required to predict radionuclide movement in the PERCOL model. Sorption was measured in single macro-ion systems and a calculation made of sorption in mixed ion systems by theoretical methods. Measurements were made in six mixed Na-Ca systems for a Na range of 0.15-0.0015 M and a Ca range of 0.002-0.004 M. Agreement was moderately good at low ionic strengths but poor at high ionic strengths. Cause of the discrepancy is being investigated.

● Biological Transport Studies

Biological Interactions

(R. C. Routson, Environmental Chemistry Section)

In cooperation with a plant and animal census site study, surface soils from four sites near the B-C crib and the Redox pond areas were sampled to measure these soils' physical and chemical properties. Soil properties being measured at all sampling sites include particle size, pH, conductivity of the

saturation extract and organic matter content of the surface soil. Fertility status (N, P, K) of composites from two depths at the crib sites are being measured to provide direct-soil input data for plant studies. The particle size, pH, and conductivity measurements were completed and the organic matter content determinations were started.

An experiment was continued to compare the relative food chain transfer of Pu-239, Am-241, and Cm-244 from tumbleweed tissue to a reference animal (rat). Comparisons are being made between the gastrointestinal uptake from plants grown on the nitrate amended soil with plants grown on complex (DTPA) amended soil with the above transuranic elements.

Gavage feeding to rats has been completed and samples are being analyzed for Pu-239, Am-241, and Cm-244 content. There is some delay in processing samples because of the need for low-level Pu analyses. Counting and analysis of data are expected within the next reporting period.

In general, DTPA did not increase the deposition of transuranics in rat tissues. The total absorption (tissue plus urine) was somewhat increased by DTPA because of an increased urinary excretion of the radionuclides. It is tentatively concluded that, although DTPA may have promoted the gut absorption of these materials, there was a compensatory removal of the metal chelates via the urinary excretion pathway.

Gable Mountain Pond Studies

(C. E. Cushing and D. G. Watson, Freshwater Ecology Section)

Experimental gold fish showed signs of oncoming spawning; they were removed to prevent diluting the genetic stock of native goldfish in the pond. The fish removed are being held in Columbia River water and fed prepared food; they will be sub-sampled to follow radionuclide retention and turnover.

PROCESS TECHNOLOGY - DEVELOPMENT ENGINEERING DEPARTMENT

Storage of High-Level Liquid Radioactive Waste

Task 2. Waste Characterization

- Wiped Film Evaporation of Residual Liquor
(R. D. Dierks, Process Demonstration Section)

Preparations are underway to test the applicability of a wiped film evaporator to the concentration of residual liquor produced in waste concentration operations. Simulated residual liquor was prepared for pilot-scale runs in a horizontal wiped film evaporator.

Task 3. Tank Integrity

- Corrosion Studies
(R. F. Maness, Corrosion Research and Engineering Section)

Studies pertinent to the cathodic protection of underground waste tank liners were continued. Two two-ft diameter tanks are being fabricated from 11 gage mild steel, one with a square corner at the bottom and the other with a rounded corner. Both types are representative of underground tanks that will be used as bottoms tanks. These small tanks will be used to determine current distribution as a function of anode placement and solution conductivity. A platinized titanium anode was ordered from Norton Corrosion; the supplier is located in England. Tests will be made to determine the life of the anode when operating at a high current density and when exposed to solidified waste.

Mild steel crevice specimens were exposed to aliquots of laboratory-prepared solidified waste which contained varying amounts of nitrite. The waste was held at 60°C and contained 15 percent excess water. After 1100 exposure hours, specimens exposed to waste containing 0, 0.1, 0.5, and 2.5 percent nitrite corroded at rates of 18, 12, 13, and 14 mils/year. Slight crevice attack and essentially no pitting was observed in all cases. Corrosion rates in "standard" waste containing 20 percent nitrite have varied from one to five mils per year with appreciable pitting. Nitrite concentrations in the range of 2.5 to 20 percent will be evaluated. Similar crevice specimens were exposed to an aqueous solution simulating the liquid phase in equilibrium with solidified waste. Again the exposures were made at 60°C as a function of nitrite content (0, 0.01, 0.05, 0.2, 1.0 M). Attack in all cases was nil after 1100 exposure hours. The reason for the difference between the corrosiveness of solidified waste and the equilibrium liquid phase is not obvious.

- Ultrasonic Inspection
(G. J. Posakony, Nondestructive Testing Section)

Evaluation of the "point probe" ultrasonic inspection system is continuing in the laboratory. The sensitivity and defect detection capability of the system has been improved by making some minor revisions to the electronic signal detection circuitry. The laboratory system has demonstrated the capability of detecting actual stress corrosion cracks in laboratory test specimens and exhibits a high

degree of sensitivity to through plate cracks. Current efforts on the program are being directed toward improvement and refinement of the "point probe" design to increase the reliability and durability of the inspection probes.

Task 5. Tank Leak Model
(B. C. Fryer, Fluid and Energy Systems Section)

The purpose of this task is to develop a mathematical fluid mechanics model that can be used to estimate tank leak rates based on probable failure modes and location, raffinate characteristics, near-field soil/fluid properties and hydrostatic head above the leak point.

Experimental evaluation of the near-field soil/fluid properties is nearly complete. A first case flow model of the near-field soil is operable on the CYBER computer. Evaluation of various types of flow models which could characterize tank wall penetrations is essentially complete. Further work will involve analysis of the near-field soil flow model.

Task 6. Leak Detection

- Liquid Level Measurement
(G. J. Posakony, Nondestructive Testing Section)

Issuance of the final report on the FIC system audit is expected by June 30.

The breadboard electronic system to be used in the initial test installation of an ultrasonic logging system has been assembled and evaluated in the laboratory. The entire electronics package has been placed in a small, portable instrument cabinet that can be easily transported to the tank farms for the initial series of in-tank tests. The electronics package has been evaluated in the laboratory under simulated waste tank conditions. Primary emphasis has been placed on making liquid level measurements by monitoring ultrasonic signal amplitude with the present instrument package. Waste characterization (presence of solids) by amplitude and phase ultrasonic measurements are to be of secondary importance for these initial tests.

Design of the ultrasonic transducers for the initial test installation is currently underway. Piezoelectric crystal elements to be used in the transducers have been procured. The transducer designs are expected to be slightly modified versions of the transducers utilized in our laboratory studies. A meeting with ARHCO personnel has been scheduled to review the design and installation requirements for the "wet wells" and transducer drive system associated with the initial test installation. Fabrication of the transducers and drive system will begin shortly.

Testing of an RF impedance liquid level detection system was continued with the primary effort directed toward determining the basic long-term stability of the system.

The tests disclosed that a cyclic variation of ± 50 parts out of a basic range of 10^5 units results from the particular temperature control system which is an integral part of the system. A zero voltage cross-over switch which drives an SCR (TRIAC) causes periodic variation in the output. The thermal output is a quartz lamp while the temperature sensor is a thermistor which is remotely mounted. The thermal time constant together with the on-off of the thermal output produces the variation. Re-design of the system appears to be necessary for improved performance.

- External Leak Detection
(M. R. Kreiter, Process Evaluation Section)

Concepts for improved waste tank leak detection are being investigated to establish leakage resolution limits. A cooperative ARHCO, BNW, Boeing proof-of-principle field test was completed in which detection methods based upon changes in soil transmissivity and soil dielectric characteristics exhibited the capability to detect small quantities of fluids injected into selected test site well casings.

The test site is located in the southwest corner of 200-West Area in undisturbed, non-contaminated soil. The test configuration consists of a series of wells placed to simulate the outer wall and center of a storage tank, monitoring wells associated with the tank, and nearby storage tanks. Although not a true analog of a real waste tank, the test wells provided proof-of-principle capabilities.

During the tests, the following information was developed for the method based on measuring changes in soil transmissivity. In general, similar responses were observed for the method based on measuring changes in soil dielectric characteristics.

- 1) A one-gallon leak of NaNO_3 solution injected into the well simulating the center of the tank was detected.
- 2) The detectivity decreases in an approximate logarithm fashion as the leakage volume is increased.
- 3) The effect of simulated rainfall stabilized at 0.1 inch and did not change appreciably while an additional 0.4 inch was applied to the ground surface.
- 4) The technique may provide the potential to determine leak plume geometry.
- 5) After injecting 1300 gallons of 3N NaNO_3 into the center well and waiting for 17 hours, a five-gallon addition into the center well was immediately detected.
- 6) The location of a five-gallon addition of NaNO_3 solution to one of the wells simulating the tank periphery was easily identified.
- 7) A five-gallon injection of raw water into one of the other tank peripheral casings was detected.
- 8) A one-gallon leak of 3N NaNO_3 from a simulated transfer pipe was detectable.

TECHNICAL ASSISTANCE TO THE HANFORD PLANT

Summary

Environmental Evaluations

Initial results from the ultra-sensitive ARMS survey of the Columbia River made in April were recieved. Additional localized deposition of radioactivity was indicated but at levels less than those previously reported. The seasonal influx of airborne fallout radioactivity was observed. The annual plant railroad survey was completed with no significant findings.

Radiation Protection

Eleven weeks' worth of in-vivo examination data was successfully processed through the new In-Vivo Record System.

Calculations of one-year and fifty-year bone and lung doses were made for routine releases of Pu from the 200-West Area during 1972.

Radiation Standards and Engineering

Purchase specifications were completed for new Hanford CP's. Neutron calibration capability improvement is continuing.

TECHNICAL ASSISTANCE TO THE HANFORD PLANT

Environmental Evaluations
(J. P. Corley, Environmental Evaluations Section)

Partial results were received from EG&G, Inc., from the ARMS survey of the river in April and generally confirm previous aerial and ground measurements. Additional plant shoreline locations of apparent small localized Co-60 depositions from past reactor operations were indicated in the river reach between the Hanford power line crossing and the sand dunes, on a gravel bar opposite the City of Richland and a sand bar opposite Sacajawea Park, but at radiation levels lower than those (a maximum of 0.03 mR/hr versus ca. 0.01 mR/hr background) observed on river islands. The originally-predicted major flood peak will probably not occur according to latest forecasts and thus may not redistribute the radioactivity observed on islands and shorelines by ARMS surveys. Ground surveys will be scheduled following the flood period, possibly in late July to more precisely measure the magnitude and distribution of this residual radioactivity.

A most unusual concentration of Pu-239 (0.037 pCi/l) was reported for Columbia River composite samples for March, both upstream at 100-B and downstream at Richland. Although less than one percent of the Concentration Guide, no explanation is available for this sudden increase by a factor of ten. An April sample showed less than the detection level. No other unusual river-associated data were reported from the routine surveillance program.

Airborne particulate radioactivity showed the expected seasonal increase from mid-April to mid-May, with the maximum off-site average of 0.26 pCi/m^3 gross beta. Gamma energy analysis indicated the presence of the usual fallout nuclides, such as Ru-106 and Ce-Pr-144. Slight increases in gamma dose measurements (TLD) were also observed at most locations.

The annual plant railroad survey was completed. No contamination was detected other than one small area of track ballast reading 300 c/m (GM) above background. No contamination was detected on monthly surveys of plant highways and ground survey plots.

The 1973 environmental surveillance report for Hanford, BNWL-1811, was cleared and sent to Printing, but issue has been delayed by higher priority work.

Radiation Protection
(K. R. Heid, Personnel Dosimetry Section)

Eleven weeks' worth of in-vivo examination data was successfully processed through the new In-Vivo Record System. The system has functioned smoothly but slowly due to poor computer "turn-around" time. Documentation of the system is 70 percent complete.

Calculations of one-year and fifty-year bone and lung doses were made for routine releases of plutonium from the 200-West Area during 1972. This data and a detailed description of the mathematical models used in these and previous calculations was prepared for inclusion in the Draft Environmental Statement for Hanford Waste Management Facilities.

Radiation Standards and Engineering
(J. M. Selby, Radiation Standards and Engineering Section)

Specifications have been finalized, procurement planning completed, and the purchase requisition is now being written for the purchase of 100 new replacement Cutie Pie radiation monitoring instruments.

A 1 mg Cf-252 source has been installed in a well in the floor of 3745A Building. The dose rate directly over the well is approximately 0.3 mrem/hr. Control and safety circuitry is now being designed, which will make the system operational.

Purchase specifications for line operated bench monitors were prepared for another contractor. The instruments are intended for use with GM, scintillation or air proportional probes.

The alpha air monitor on the 231-Z stack was brought in and examined after it failed to respond to a source test. The unit worked satisfactorily after a film that had formed over the detector was removed. An investigation to determine the source of the coating material is in progress.

Meteorological Services
(E. H. Phinney, Synoptic Meteorology Section)

Meteorological services, viz., weather forecasts and observations and climatological services were produced to plant operations and management on a routine basis.

May 1974

<u>Type</u>	<u>No. Made</u>	<u>% Reliability</u>
Production Forecasts:	62	84.9
General Forecasts:	62	90.2
Special Forecasts:	266	82.5
Other Requests:	279	
Publications Distributed:	164	
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