

FINAL REPORT

PRELIMINARY RADIOLOGICAL ASSESSMENT
OF THE PERMANENT MOLD DIVISION AREA

CLEVELAND, OHIO WORKS
THE ALUMINUM COMPANY OF AMERICA

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"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



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CLEVELAND, OHIO WORKS
THE ALUMINUM COMPANY OF AMERICA

PREPARED FOR
THE ALUMINUM COMPANY OF AMERICA

NOVEMBER 14, 1990
PROJECT NO. 90249.4

REMCOR, INC.
PITTSBURGH, PENNSYLVANIA

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1.0 INTRODUCTION

Remcor, Inc. (Remcor) has been retained by The Aluminum Company of America (Alcoa) to conduct a preliminary radiological assessment of a portion of the Cleveland Works. The assessment consisted of collecting soil samples from locations specified by Alcoa in the permanent mold division area of the Cleveland Works. The field portion of this project was conducted between August 13 and 15, 1990. The soil samples were analyzed in an off-site laboratory for thorium and uranium based radioactivity. This report describes the field sampling work and the analytical methods and presents the data resulting from this work.

1.1 SITE BACKGROUND AND DESCRIPTION

The Alcoa Cleveland Works is a large, multiple function aluminum refining, casting, and finishing facility located at 2210 Harvard Avenue in the villages of Newburgh Heights and Cuyahoga Heights, suburbs of Cleveland, Ohio (Figure 1). The permanent mold casting division area is located at the southeast corner of the Cleveland Works. This is an idle facility currently being prepared for possible sale or reconstruction. The project site lies near the south and east boundaries of the Alcoa property. The assessment area location is shown in Figure 2.

The properties of other owners contiguous to the assessment area are as follows:

- The property to the east is owned by the McGean-Rohco Chemical Company (McGean). This site was formerly owned by Chemetron Investments, Inc. (Chemetron), a subsidiary of Allegheny International, Inc. Portions of this property are the subject of an ongoing effort to remediate low concentrations of depleted uranium.
- The property to the south is an out-of-service railroad track owned by the Newburgh and South Shore Railroad Company (N&SS).

The assessment area was extended onto the N&SS property at the direction of the Alcoa project engineer. Steel fabric fences, about eight feet in height, mark the approximate property lines between the Alcoa, McGean, and N&SS properties. The railroad property and a strip of the Alcoa property about six feet wide adjacent to the fence are surfaced with gravels, cinders, and natural soils. The remainder of the Alcoa property in the assessment area is paved with concrete.

According to the Alcoa project team, the assessment area is a portion of land where American Magnesium Company (AMC), a wholly owned subsidiary of Alcoa, was located. AMC was dissolved in 1954. AMC is reported to have used this site to process and fabricate magnesium metal for a variety of products. Some of the magnesium processing and fabrication activities conducted by AMC are reported to have involved the use of radioactive thorium-containing materials as hardening agents. This use of thorium is reported to have been initiated around 1900 and to have halted before or during 1954. It should be noted that Remcor has no information describing the quantities or forms of thorium used by

AMC. According to the Alcoa personnel directing this assessment, activities conducted by Alcoa or its subsidiaries at this site have not involved the use of thorium or other radioactive materials since 1954.

As part of the shutdown and decommissioning of the permanent mold casting division area, Alcoa has performed a variety of environmental investigations. These investigations included a surface radiation survey, described in Section 1.3, which indicated an area of elevated surface radiation along the fence line between the Alcoa and N&SS properties near the southeast corner of the Alcoa property. Alcoa retained Remcor to conduct a preliminary radiological assessment of this area of elevated surface radiation, and Remcor's assessment has been limited to this area and its immediate surroundings by Alcoa's direction.

As reported by Alcoa, there are no underground utilities in the assessment area. Overhead wires directly above the fence are believed to be inactive. However, the borings were located to avoid contact with these wires. The railroad track in the assessment area is inactive and was not an impediment to this project.

1.2 APPLICABLE REGULATIONS

The U.S. Nuclear Regulatory Commission (NRC) has regulatory authority over radiological assessments and remediations. The NRC

regulations are published in Title 10 of the Code of Federal Regulations (CFR). However, this site is not currently the subject of an NRC radioactive materials license, so NRC regulations are not directly applicable. Specific NRC regulations do provide valuable guidance to this assessment program relating to worker safety and environmental protection. The NRC regulations used as guidance in this project include Part 20 of Title 10 of the CFR (10 CFR 20), "Standards for Protection Against Radiation."

1.3 PREVIOUS INVESTIGATIONS

The current Remcor work is the fourth effort to assess potentially elevated thorium content in this area of the Cleveland Works. In these efforts, the radionuclide of principal concern has been Thorium-232 (Th-232). The three preceding efforts are identified as follows:

- In 1985, Oak Ridge Associated Universities (ORAU), working for NRC, collected 10 soil samples from 5 shallow borings along the Alcoa-N&SS fence line. The analytical results from these samples indicated elevated thorium contents in some of the soils in this area.
- In 1989, NUS Corporation (NUS), working for Alcoa, conducted a limited survey of surface radiation in the yard areas and building ground floors in the permanent mold casting division area. The reported results for this survey indicated limited area of elevated surface radiation in the same general area as that sampled by ORAU.
- In 1990, Remcor, as part of the Chemetron site remediation program, collected 58 soil samples from the Alcoa and N&SS properties. The purpose of this sampling program was to determine if depleted Uranium-238 (U-238) had migrated into the Alcoa or N&SS properties. Five of these samples were analyzed for thorium content, and the results of these analyses tended to confirm the presence of elevated thorium contents in those areas identified in the first two efforts. The sample and uranium analysis results for

the 20 samples collected on Alcoa property during this effort were reported to Alcoa by letter on November 8, 1990. The results of the thorium analyses and the results for the samples from the N&SS property are summarized in this report.

The methods and results of these three earlier efforts are described in more detail in Chapter 2.0 and in Appendix A. These data have been used in preparing the estimates of thorium-containing material locations and volumes presented in this report.

1.4 ASSESSMENT OBJECTIVES

Based on the direction provided to Remcor, this assessment has been designed to aid Alcoa in addressing three objectives, as follows:

- To test for the presence of Th-232 and U-238 in the area of elevated radiation reported from the previous investigations
- To correlate the results of previous investigations with those from this assessment
- To assist Alcoa, as directed, in defining and meeting the needs and objectives of the NRC in managing this site.

1.5 COORDINATION WITH THE ALUMINUM COMPANY OF AMERICA

During this project, the Remcor project team maintained close, continuous coordination with Alcoa's project representatives, Messrs. Mark Gradert and Richard King. This coordination included the following:

- Daily reports of progress and costs on a time-and-materials basis

- Written notification of results obtained and conditions observed
- Written notifications of scope or method changes with written approval from Alcoa before such changes were implemented.

Copies of Remcor's Daily Foreman's Reports are presented in Appendix B. The Alcoa project representatives maintained close control and direction over the field work program, including boring and surface sample locations.

1.6 PROJECT ORGANIZATION

This report, including the Introduction, is presented in five chapters, as follows:

- Chapter 2.0 - Summary of Previous Investigations, presents a brief summary of where areas of elevated activities were identified in the earlier investigations
- Chapter 3.0 - Methods of Investigation, describes methods employed to gather the data necessary for achieving the study objectives, including health and safety and analytical requirements
- Chapter 4.0 - Results, is a detailed summary of field observations, field screening procedures, and analytical results
- Chapter 5.0 - Conclusions, presents Remcor's interpretation of the results, the estimated volume of contaminated material, and relevant regulatory issues.

In addition to the text, there are five appendices. These are:

- Appendix A - Data from Previous Investigations
- Appendix B - Remcor, Inc. Daily Foreman's Reports
- Appendix C - Health and Safety Data

- Appendix D - Soil Boring and Surface Soil Sample Description Logs
- Appendix E - Analytical Data and Chain-of-Custody Forms.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS

The current Remcor assessment is the fourth investigation concerned with identifying areas of elevated radioactivity, relative to background, in this area of the Alcoa facility.

This chapter presents a brief description of previous radiological assessment work related to this area. Relevant data from these assessments are presented in Appendix A.

2.1 OAK RIDGE ASSOCIATED UNIVERSITIES, 1985

The first assessment was conducted by ORAU in 1985 for the NRC. This investigation was conducted as part of a confirmatory radiological assessment of the Chemetron property, which adjoins Alcoa to the east. The objective was to determine if U-238 had migrated onto the Alcoa property. The results of that assessment are presented in ORAU's "Confirmatory Radiological Survey of the Harvard Avenue Property, Chemetron Corporation, Newburgh Heights, Ohio," dated September 1988. During that assessment, five shallow soil borings were completed along the fence separating the Alcoa and N&SS properties (Figure 3). A total of 10 soil samples were collected and analyzed for U-238 and Th-232 by gamma spectroscopy. The deepest soil sample was collected from 1.5 feet below the surface.

Analytical results of samples from the ORAU soil boring study indicate that the Th-232 above background is primarily located in surficial soils. The Th-232 results of the surface samples range from 15.5 picoCuries per gram (pCi/g) to 620 pCi/g. Sample OR-4 (Figure 3) was collected from the area along the fence between Grid Nodes E-5 and F-5 and exhibited 620 pCi/g Th-232. The deepest Th-232 contamination was also identified in the sample from this location. This was 13.1 pCi/g at 1.5 feet. The U-238 results for these samples tend to mirror the Th-232 results (i.e., when Th-232 is present, U-238 is also present in a similar concentration).

2.2 NUS CORPORATION, 1989

The second investigation was conducted by NUS for Alcoa. The investigation report was titled "Radiation Survey of the Harvard Avenue Property for Aluminum Company of America" and dated August 1989. This investigation consisted of establishing a grid network and conducting a radiation intensity survey on the surface using a microrem meter, which measures total energy.

The NUS study presented results for a dose rate of gamma radiation in microrems per hour ($\mu\text{r/hr}$). Four areas of elevated radiation (i.e., greater than 15 $\mu\text{r/hr}$) were identified and are shown in Figure 3. All of the areas are along the fence, but the most prominent area of apparent elevated activity lies in NUS Grids G-5 through C-5 and is approximately 70 feet long and 20 feet wide.

2.3 REMCOR, INC., SPRING 1990

The third investigation was performed by Remcor during the spring of 1990 as part of a radiological assessment and remediation project at the Chemetron site. The objective of that investigation was to determine if U-238 had migrated onto the Alcoa and railroad properties from the Chemetron site.

During this assessment, a total of 58 soil samples were collected from shallow borings; of these borings, 20 were made on Alcoa property and 38 on N&SS property. The borings on Alcoa property were within 13 feet of the boundary between Alcoa property and the Chemetron site and were located along the 490-foot length of that boundary. The borings on N&SS property are clustered around the fence line and railroad tracks south of the Alcoa property and west of the Chemetron site. The locations of these borings are shown in Figure 4:

Borings were made with a split-spoon sampler, and continuous soil samples were recovered to a depth of six feet at each boring location. Each core was field screened for elevated radiation using a beta/gamma meter. This meter is a scaler counter and field count results were corrected for background and presented as corrected counts per minute (ccpm). Based on the field counts, 29 samples were selected for laboratory analysis for uranium-based activity. The 29 samples selected for laboratory analysis included 9 samples with elevated field ccpm from the N&SS property.

The 20 samples from the Alcoa property were analyzed for uranium content to confirm the field data indications that uranium had not migrated onto the Alcoa property.

Analysis of these samples for uranium-based activity was performed in a field laboratory at the Chemetron site. Each sample was analyzed by gamma spectroscopy using a germanium source. Gamma energy peaks were recorded, and uranium content was calculated using energy peaks associated with uranium decay products occurring in known proportion to uranium content. The uranium analysis results are tabulated in Figure 4.

The results of this survey and analysis effort have not been published as a formal report. The data from the field survey and the analysis results for the 20 samples for that part of this assessment program relating to Alcoa property were reported to Alcoa in a letter dated November 8, 1990.

Five of the samples analyzed for uranium content were sent to an independent off-site laboratory for thorium analysis. These samples were selected as follows:

- Two from the 20 samples from the Alcoa property were chosen at random
- Two from the N&SS property were chosen at random
- One sample from the N&SS property represented an area of anomalous appearing material with elevated ccpm in the field survey.

These samples were analyzed by alpha spectroscopy for thorium content. Each of the four randomly selected samples were found to contain less than 10 pCi/g of thorium. The fifth sample, from the area of elevated gamma radiation on N&SS property, was found to contain 1,127 pCi/g of Th-232. These results were reported by letters to Alcoa on June 11, 1990 and to the NRC on June 20, 1990.

Results of the field screening from this investigation indicate that three areas of elevated activity (i.e., greater than 100 ccpm) exist as shown in Figure 3.

3.0 METHODS OF INVESTIGATION

Remcor mobilized to the site on August 13, 1990 and demobilized on August 15, 1990. During that period, nine soil borings were completed and sampled in accordance with Remcor's draft Work Plan dated August 6, 1990. In addition, a limited walkover survey was conducted and six surface soil samples were collected at Alcoa's direction. The Remcor field personnel were in daily contact with Messrs. Gradert and King, receiving direction and providing status reports throughout the period that field work was in progress. The Remcor daily reports are presented in Appendix B.

Remcor secured the services of three subcontractors to assist in the completion of this investigation. Nuclear Energy Services (NES) of Danbury, Connecticut provided radiological monitoring and health physics support. Lake Drilling of Cleveland, Ohio provided drilling services. Alpha Energy Laboratories, Incorporated (Alpha Laboratories) of Arlington, Texas performed the laboratory radiological analyses. (During this investigation, Alpha Laboratories changed ownership and became Scientech, Inc. However, the laboratory will still be referred to as Alpha Laboratories for this report.)

3.1 INSTRUMENTATION

Remcor and its subcontractor NES used various field screening instruments during this investigation. In addition to being

utilized as investigatory tools, these instruments were used for personnel health and safety purposes as discussed below.

These instruments, along with brief descriptions of their functions, are presented below:

- HNu™ Photoionization Detector (10.2-Electron Volt Lamp) (HNU™) - Used for detecting concentrations of total volatile organic compounds (VOCs) relative to a calibration standard (56 parts per million [ppm] isobutylene). The HNU™ is calibrated daily. It does not provide compound specific results.
- Ludlum 2220 Beta/Gamma Survey Meter (Beta/Gamma Meter) - This is a scaler/counter used for real-time counting of beta/gamma radiation emission. This instrument is calibrated yearly.
- Ludlum 2221 Alpha Survey Meter (Alpha Meter) - This is an alpha particle scintillation meter that detects alpha radiation emissions. This instrument is calibrated yearly.
- Portable High-Volume Air Sampler (HVAS) - Used to collect airborne particulate samples for radiological testing. As specified by the manufacturer's operating instructions, this instrument was calibrated at the beginning of the project.

3.2 HEALTH AND SAFETY

The on-site activities were conducted in accordance with Remcor's site-specific health and safety plan (August 7, 1990). Prior to initiating work, Remcor conducted a health and safety meeting with NES, Lake Drilling, and Mr. Gradert. During this meeting, the radiological, chemical, and physical hazards known to exist in the area of the investigation were discussed. In addition, procedures concerning personal safety and decontamination were outlined. A controlled area was established, as shown in

Figure 2, using yellow "caution tape" and appropriate radiological warning placards.

Personnel working inside the control area wore thermoluminescent dosimeters to monitor exposure. Bioassays were collected from each field worker prior to starting work and at its completion to measure worker radiation exposure in accordance with NRC regulations (10 CFR 20) being applied as guidance to this assessment.

Work inside the control area was conducted in the presence of the NES Health Physics (HP) technician. The HP technician performed air monitoring during drilling operations using the HVAS and alpha meter to determine if airborne particulate matter with detectable activity was being generated. The results of the air monitoring are presented in Chapter 4.0 and Appendix C.

Personal protective equipment (PPE) for field personnel performing work-related drilling and collecting samples included Tyvek® coveralls, gloves, boot covers, steel-toe shoes, hard hats, and safety glasses. Personnel performing functions that did not require direct exposure to or contact with the soil (e.g., locating boreholes), were not required to wear coveralls. Prior to exiting the controlled area, personnel were "frisked" with the beta/gamma meter to determine if their clothing had been contaminated. Disposable PPE was containerized and left on site pending the results of sample analysis. Alcoa installed temporary fencing around the controlled area after field activities were completed.

3.3 SOIL BORING STUDY

A total of nine soil borings were completed during this investigation. Soil boring logs are presented in Appendix D.

3.3.1 Location Selection

The soil boring locations were determined by Alcoa. The locations were selected by Alcoa so that data could be obtained to meet the assessment objectives, as presented in Section 1.2. The soil borings are located relative to the grid network from the NUS surface radiation survey that was reestablished for this assessment, as shown in Figure 2.

The nine soil borings were completed at the locations shown in Figure 2. Six borings (SB-1, SB-2, SB-3, SB-6, SB-7, and SB-8) were completed on Alcoa property near the Alcoa-N&SS fence line. Boring SB-6 was drilled near the center of an area that was previously identified as containing thorium-bearing materials. Borings SB-1, SB-2, and SB-3 were located to identify the lateral boundary of contamination. Boring SB-7 was located to identify the depth of contamination, if any, migrating to the Alcoa property from the Chemetron property. Boring SB-8 was located to identify Th-232, if present, along the railroad on the Alcoa property. Two borings (SB-4 and SB-5) were completed on the railroad property between the railroad track and the fence. The final boring, SB-9, was completed on the Alcoa property in front of Building 65 near Harvard Avenue and served as a background/control location.

3.3.2 Drilling

Drilling services were provided by Lake Drilling of Cleveland, Ohio. The borings were completed using hollow-stem augers with an outside diameter of 3-1/4 inches. Soil cores were collected using split-spoon samplers (2 feet by 2 inches). During drilling, the cuttings were collected onto plastic sheeting. After the borehole was completed, the cuttings were transferred to a 55-gallon drum. Two 55-gallon drums containing drill cuttings and plastic sheeting were left on site, along with one drum of discarded PPE.

The HVAS was used to collect air samples in the immediate vicinity of the borehole and cuttings during drilling. Each boring was completed to a depth of 10 feet. The boreholes were filled with a grout slurry at the completion of this investigation. Each soil boring was logged by the Remcor geologist; these logs are presented in Appendix D.

3.3.3 Sampling Procedures

Continuous soil cores were collected in two-foot increments with the split-spoon sampler. Therefore, five cores were collected from each hole. The soil cores were collected in accordance with the American Society for Testing and Materials Method D 1586, "Penetration Test and Split-Barrel Sampling of Soils," for conducting standard penetration tests. When each core was opened, it was screened for VOCs using the HNu™. It was also screened

with the beta/gamma probe to identify radioactivity relative to background.

Because the cores did not contain detectable levels of radioactivity (Section 4.1.1), soil from each core was homogenized into one sample; hence, five samples were collected from each borehole. The exceptions to this were at SB-1 and SB-6. The 2- to 4-foot core from SB-1 yielded zero percent recovery, so no sample could be collected. At SB-6, two samples were collected from the 0- to 2-foot core because a distinct horizon of gray ash-like material was present from 0 to 6 inches. The first sample was from 0 to 6 inches, and the second was from 6 to 24 inches.

To collect a sample, soil was transferred to a sample container using a clean, stainless steel spoon. Sample containers were 500-milliliter polypropylene bottles. All sample collection activities were performed over polyethylene sheeting laid on the ground.

Each sample was labeled with a unique identification code that was a function of the project name, the borehole number, and depth of collection (e.g., RAL-SB-01-24 indicates the sample is from the Remcor-Alcoa investigation, collected at SB-1 from a depth of 2 to 4 feet). Each sample label also contained the name "Remcor," the Remcor project number, date of sample collection, and initials of the person collecting the sample.

The 0- to 2-foot and 2- to 4-foot samples from each borehole were submitted to the laboratory, except at SB-6 where the three samples from 0 to 4 feet were submitted. The 19 samples and completed chain-of-custody (COC) forms were sent to the laboratory via overnight delivery. Copies of these COC forms are included in Appendix E.

3.3.4 Decontamination

The augers used to complete the soil borings were decontaminated by removing soil with a wire brush. The HP technician surveyed each auger with the beta/gamma meter after decontamination to ensure that particles exhibiting elevated activity were not present.

Split-spoon samplers and stainless steel spoons used to transfer samples into containers were decontaminated in the following manner:

- Removal of soil with a wire brush and/or paper towel
- Spray lightly with Windex® solution and wipe clean
- Survey with beta/gamma probe to ensure successful decontamination.

The objective of the procedures outlined above was to adequately decontaminate the equipment without generating relatively large volumes of water. The water would have had to be containerized to prevent the migration of any contamination either in the water or on the ground surface.

3.4 LIMITED SURFACE SURVEY

Acting under direction of the Alcoa project representatives, Remcor conducted a very limited, informal, surface survey of the area immediately along the fence in the area between Borings SB-4 and SB-8 (Figure 2). The objective of the survey was to obtain additional general data to assist Alcoa in determining where to locate additional soil borings and in determining whether additional surface soil samples were necessary. The survey area definition, by the Alcoa project representatives, was based on the results of the surface grid survey of gamma radiation conducted by NUS in 1989 covering a larger area at the Alcoa property including and extending beyond the area of the current assessment. (This NUS survey is described in Section 1.3.) The Remcor survey was conducted August 15, 1990 after SB-1 through SB-6 had been completed. The Remcor survey is described as informal because it was not conducted in accordance with the strict NRC requirements for a surface radiological survey in that every portion of a given area was not surveyed.

To conduct the survey, the HP technician held the beta/gamma probe approximately 3 inches above the ground surface at random locations within the area shown in Figure 2. Survey points were typically within a 5- to 10-foot radius of each other. Soil areas with detectable activity relative to background were marked with spray paint for further investigation.

3.5 SURFACE SOIL SAMPLING

Six surface soil samples were collected at Alcoa's direction after SB-8 had been completed. The objective of the surface sampling activities was to collect data to increase the accuracy of lateral contaminant boundary estimates.

3.5.1 Location Selection

The six soil sample locations (Figure 2) were selected by Alcoa and Remcor after review of the available soil boring data and results of the limited surface survey. Location SS-1 was selected because it contained the gray ash-like material that was visually similar to material that had been identified as containing Th-232 in the earlier Remcor investigation. Location SS-2 was selected because it was not possible to locate a soil boring in this area because of access obstruction due to the overhead lines. The remaining locations were selected in an effort to more accurately define the occurrence of Th-232.

3.5.2 Sampling Procedures

The surface soil samples were collected into Ziploc® bags using a clean shovel. Each sample was labeled with a unique identification number according to the following scheme:

RAL-SSXX

where:

XX was a consecutive number (e.g., RAL-SS01 followed by RAL-SS02).

Each sample label also contained the name "Remcor," the Remcor project number, date of sample collection, and initials of the person collecting the sample. All six soil samples were submitted to the laboratory in sealed, plastic coolers via overnight delivery. COC forms for these samples are presented in Appendix E.

3.5.3 Decontamination

The spade used to collect the samples was decontaminated prior to each use in the following manner:

- Remove loose soil with a wire brush and/or paper towels
- Spray with Windex® and wipe clean
- Survey with beta/gamma meter to ensure successful decontamination.

3.6 ANALYTICAL PROCEDURES

All 25 soil samples (19 from the soil borings and 6 surface samples) were analyzed for concentrations of isotopic Th-232 and U-238 using gamma spectroscopy (spec) techniques by Alpha Laboratories.

Gamma spec is an indirect method for determining concentrations of Th-232. Because these isotopes do not emit significant gamma radiation, the spec technique employs the measurement of daughter products that are gamma emitters. After determining the concentrations of the daughter products Actinium-228 (Ac-228) and Thallium-208 (Tl-208) and their relative ratios, the laboratory can

calculate the concentration of Th-232 in each sample. The concentration of U-238 in each sample was measured by determining the concentration of its indicator daughter product Proactinium-234 (Pa-234).

The laboratory performed the gamma spec according to the principals of the U.S. Department of Energy Procedure G-2 for analyzing gamma emitters (Document IDO-12069, Radiological Environmental Science Laboratory, Chemical Branch, Procedure Manual, U.S. Government Printing Office, Washington, DC). Generally, this method requires that the sample be dried, ground/homogenized, weighed (approximately 100 grams), and placed in a Marinelli beaker prior to analysis. The analyses were performed by counting the sample's gamma radiation using a Germanium/Lithium [Ge(Li)] high-resolution detector for between 100 and 500 minutes. The data are processed by Alpha Laboratories' data acquisition system, which calculates the final concentrations and estimated error. The results of this analytical work are presented in the next chapter.

4.0 RESULTS

4.1 SOIL BORING STUDY

The soil boring logs (Appendix D) indicate that the assessment area is generally underlain by fill material consisting of cinders and brick fragments of various sizes to approximately 5 feet below the land surface. Based on findings at SB-9, native soil, comprised of brown silty clay, appears to exist below the fill to the total depth of the boreholes. Geology at depth has not been evaluated in this assessment. Surface soil generally consists of cinders or black loam, except where a gray ash-like material was observed, as shown in Figure 2.

Alcoa reports that ground water is typically found at approximately 15 feet below ground surface. This appears to be consistent with the field findings of a significant increase in the moisture content of the deeper soil.

4.1.1 Field Screening

The soil cores were screened in the field using the beta/gamma probe and the HNu[™] prior to sample collection. The results, with the exception of soil from the 0- to 6-inch sample at SB-6 (Sample SB-6-0.5), exhibited nondetectable activity (NDA). Sample SB-6-0.5 exhibited 20 ccpm, which is a measurement corrected for background. Results are presented on the soil boring logs in Appendix D.

Air monitoring results (Appendix C) indicated that no particulate matter with detectable activity were emitted during this investigation.

The HNu™ measurements exhibited background concentrations that ranged between 0 and 2 ppm, calibrated to the isobutylene standard.

4.1.2 Analytical Results

Analytical results have been tabulated and are presented in Table 1. Th-232 results from the 0- to 2-foot samples are shown in Figure 3. Copies of the laboratory reports are presented in Appendix E.

The greatest concentration of Th-232 detected from any of the soil boring samples was 6.55 pCi/g in the 0- to 2-foot sample from SB-1. The other Th-232 results are less than 4.70 pCi/g. The greatest concentration of U-238 was 6.49 pCi/g from the 0- to 2-foot sample collected from SB-2. The average background concentration of Th-232 and U-238 were 0.78 and 3.37 pCi/g, respectively, as determined from results of the samples submitted from SB-9.

Three of the samples, RAL-SB1-24, RAL-SB3-24, and RAL-SB6-24, were randomly selected for reanalysis to provide replicate data. The results, shown in Table 1, indicate that the analytical method provides reproducible results.

4.2 SURFACE WALKOVER

The only area exhibiting elevated beta/gamma emission as measured by the beta/gamma meter began at approximately Grid Node F-1 and continued to Grid Node E-1. Measurements within that area ranged from 100 to 500 ccpm.

4.3 SURFACE SOIL SAMPLES

Surface sample logs are presented in Appendix D. All the samples consisted of either black loam or cinders, except at SS-1, which consisted of gray ash-like material.

4.3.1 Field Screening

The surface soil samples exhibited NDA, except SS-4, which exhibited 200 ccpm. Similarly, the HNu™ did not indicate any total VOC concentrations greater than background.

4.3.2 Analytical Results

The analytical results are summarized in Table 1. The Th-232 results are shown in Figure 3. The laboratory reports are presented in Appendix E. The highest concentrations of Th-232 detected was 46.3 pCi/g in Sample SS-4. The greatest concentration of U-238 detected was 41.1 pCi/g, also from Sample SS-4. All other Th-232 results are less than 1.73 pCi/g. Samples SS-4 and SS-5 were selected for reanalysis. These results are also shown in Table 1 and indicate that the analytical method yields reproducible results.

5.0 CONCLUSIONS

The results of the three previous investigations indicate that Th-232 is present in concentrations exceeding the NRC release criteria along the southeastern portion of the Alcoa property boundary. The results of the current assessment indicate that these contaminated materials are not laterally extensive and that they are confined to surface soils. These results also indicate that the contaminated materials cannot be visually differentiated from noncontaminated materials.

In a Branch Technical Position Paper titled "Disposal or On-Site Storage of Thorium or Uranium Wastes from Past Operations," the NRC provides guidance in residual thorium concentrations at sites considered by NRC to be eligible for unrestricted release or public access. This paper was published in the Federal Register Volume 45, No. 205, on October 23, 1981. The guidance limit established in this paper for thorium is 10 pCi/g. In general, the NRC has granted unrestricted release to sites remediated to this level of Th-232 based activity. In evaluating this project site, this guidance has been used as the target cleanup level.

Figure 5 shows the areas that the results indicate may contain Th-232 in concentrations greater than 10 pCi/g. The volume of contamination as determined from direct measurements (i.e., analytical results from surface samples) is estimated to be 250

cubic feet (ft^3), assuming a contaminated thickness of 6 inches. The contaminated volume as determined by indirect methods (i.e., surface walkover surveys) is estimated to be approximately 900 ft^3 , assuming a thickness of 6 inches. Based on the data and Remcor's experience, a reasonable conservative estimate of material containing greater than 10 pCi/g in the assessment area is 1,000 ft^3 . This estimate allows for excavation of 2,000 square feet to an average depth of 6 inches. This allowance for excavation beyond the limits apparent from the field work is based on prior experience in remediation of sites of this type.

TABLE 1
ALCOA - CLEVELAND WORKS

SUMMARY OF
THORIUM - 232 AND URANIUM 238 ANALYTICAL RESULTS

SOIL BORING SAMPLES

SAMPLE ID	SOIL BORING ID	DEPTH (FT)	THORIUM-232 RESULT (pCi/g)	URANIUM-238 RESULT (pCi/g)
RAL-SB-1-02	SB-1	0-2	6.55	25.4
RAL-SB-1-24	SB-1	2-4	1.04/1.08	0.39/0.12
RAL-SB-2-02	SB-2	0-2	0.52	6.49
RAL-SB-2-24	SB-2	2-4	0.54	4.13
RAL-SB-3-02	SB-3	0-2	1.21	13.7
RAL-SB-3-24	SB-3	2-4	0.47/0.77	0.42/0.00
RAL-SB-4-02	SB-4	0-2	0.26	0.45
RAL-SB-4-24	SB-4	2-4	0.57	3.95
RAL-SB-5-02	SB-5	0-2	0.80	5.84
RAL-SB-5-24	SB-5	2-4	0.93	0.41
RAL-SB-6-0.5	SB-6	0-0.5	4.71	0.64
RAL-SB-6-.52	SB-6	.5-2	0.11	4.69
RAL-SB-6-24	SB-6	2-4	0.66/0.54	0.35/0.00
RAL-SB-7-02	SB-7	0-2	0.50	0.19
RAL-SB-7-24	SB-7	2-4	0.07	0.50
RAL-SB-8-02	SB-8	0-2	0.09	1.51
RAL-SB-8-24	SB-8	2-4	0.54	0.41
RAL-SB-9-02	SB-9	0-2	0.71	4.19
RAL-SB-9-24	SB-9	2-4	0.54	0.41

SURFACE SOIL SAMPLE RESULTS

SAMPLE ID	THORIUM-232 RESULT (pCi/g)	URANIUM-238 RESULT (pCi/g)
RAL-SS1	0.95	1.25
RAL-SS2	0.36	8.07
RAL-SS3	0.001	0.51
RAL-SS4	46.3/37.4	41.1/23.2
RAL-SS5	0.20/0.73	0.64/0.00
RAL-SS6	0.05	42.0

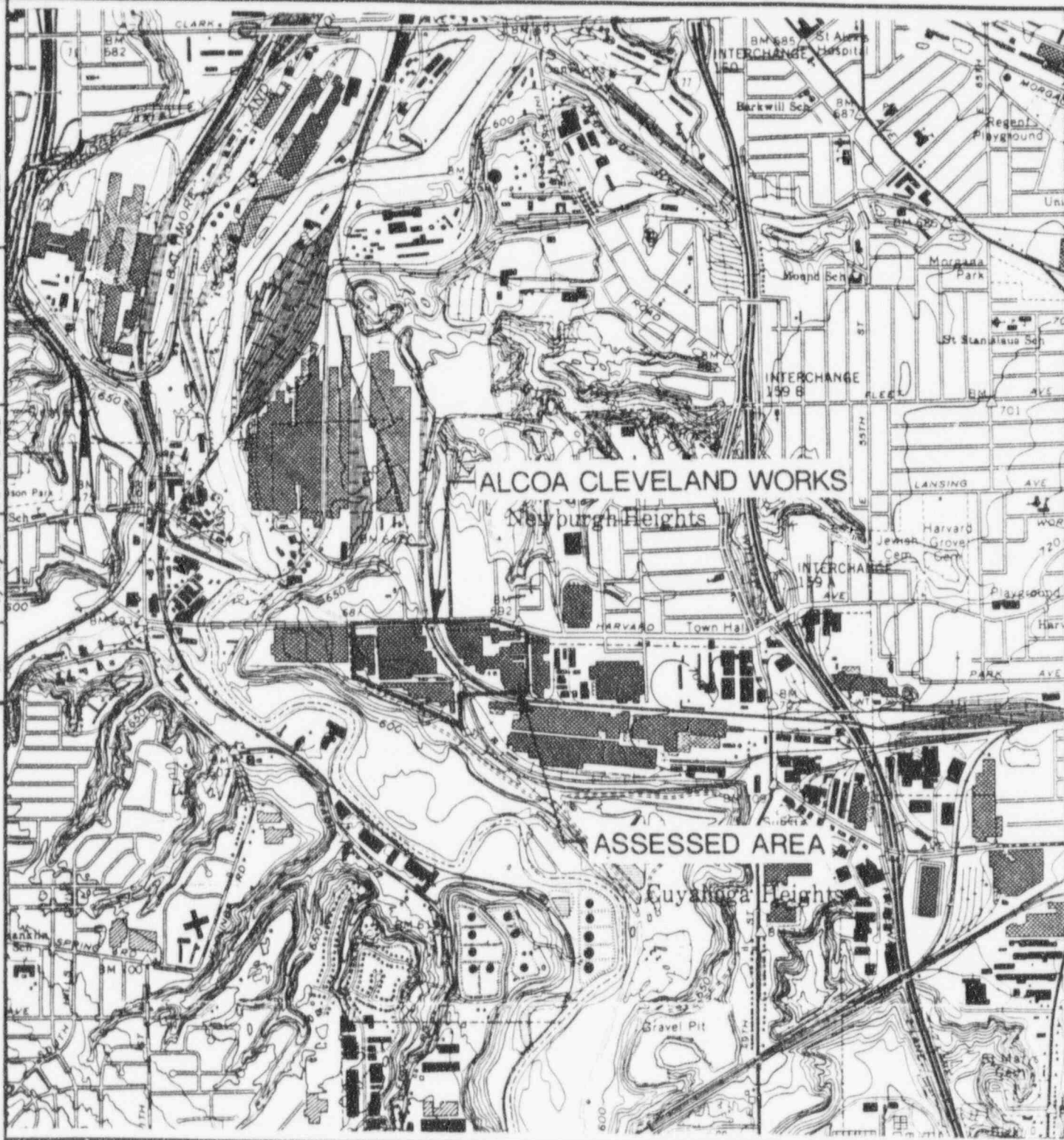
NOTE: Samples with two concentrations for each isotope represent the initial and reanalysis results.

DRAWING NUMBER 90249-A1

CHECKED APPROVED

L.H.K.
9/19/80

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SCALE, FEET
0 2000 4000



FIGURE 1

ALCOA SITE
LOCATION MAP

ALCOA
CLEVELAND WORKS

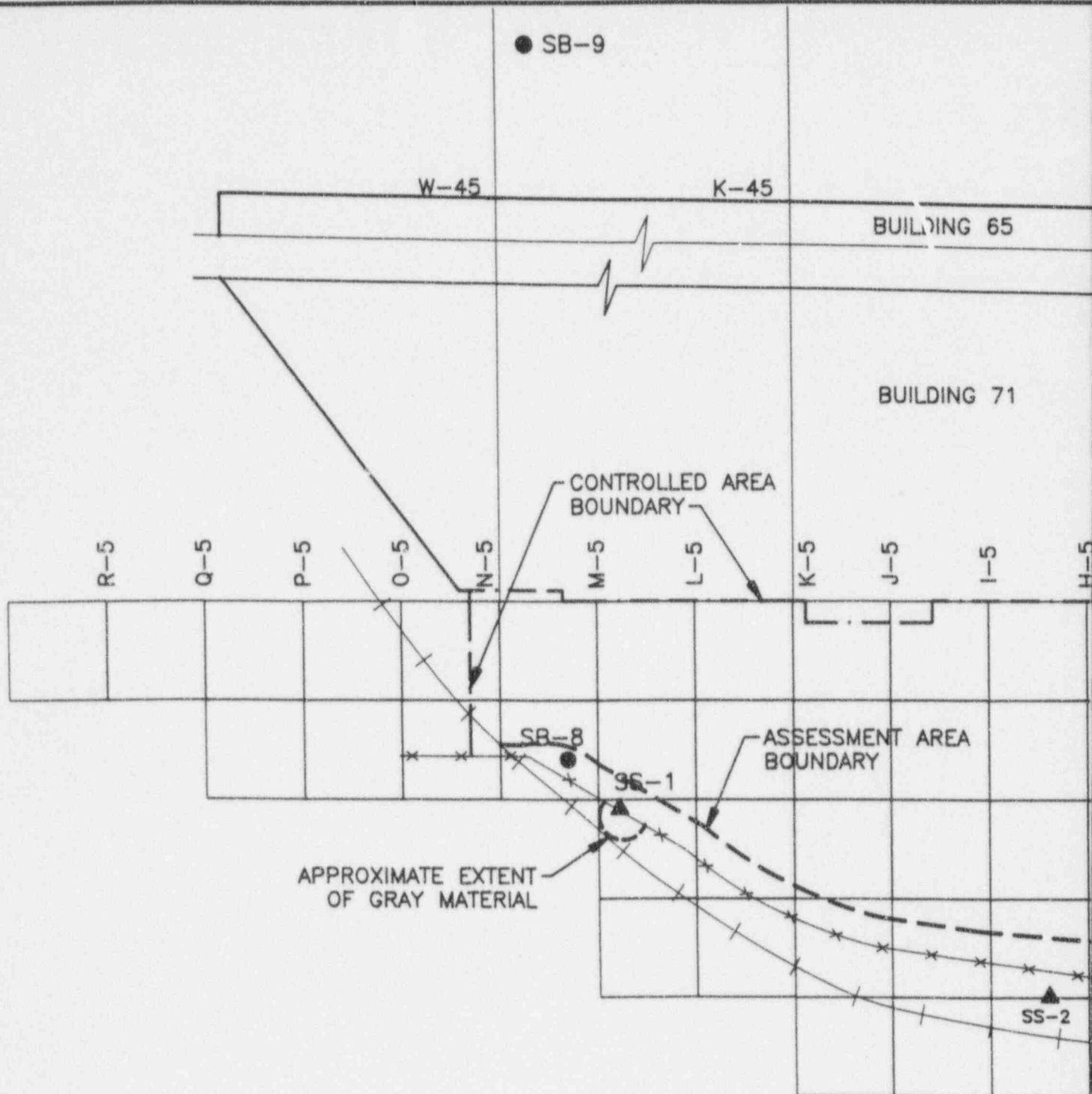
PREPARED FOR

ALCOA
CLEVELAND, OHIO

REFERENCE:

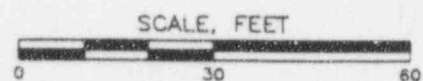
USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE
CLEVELAND SOUTH, OHIO, 1963
PHOTOREVISED 1984. SCALE 1=24,000

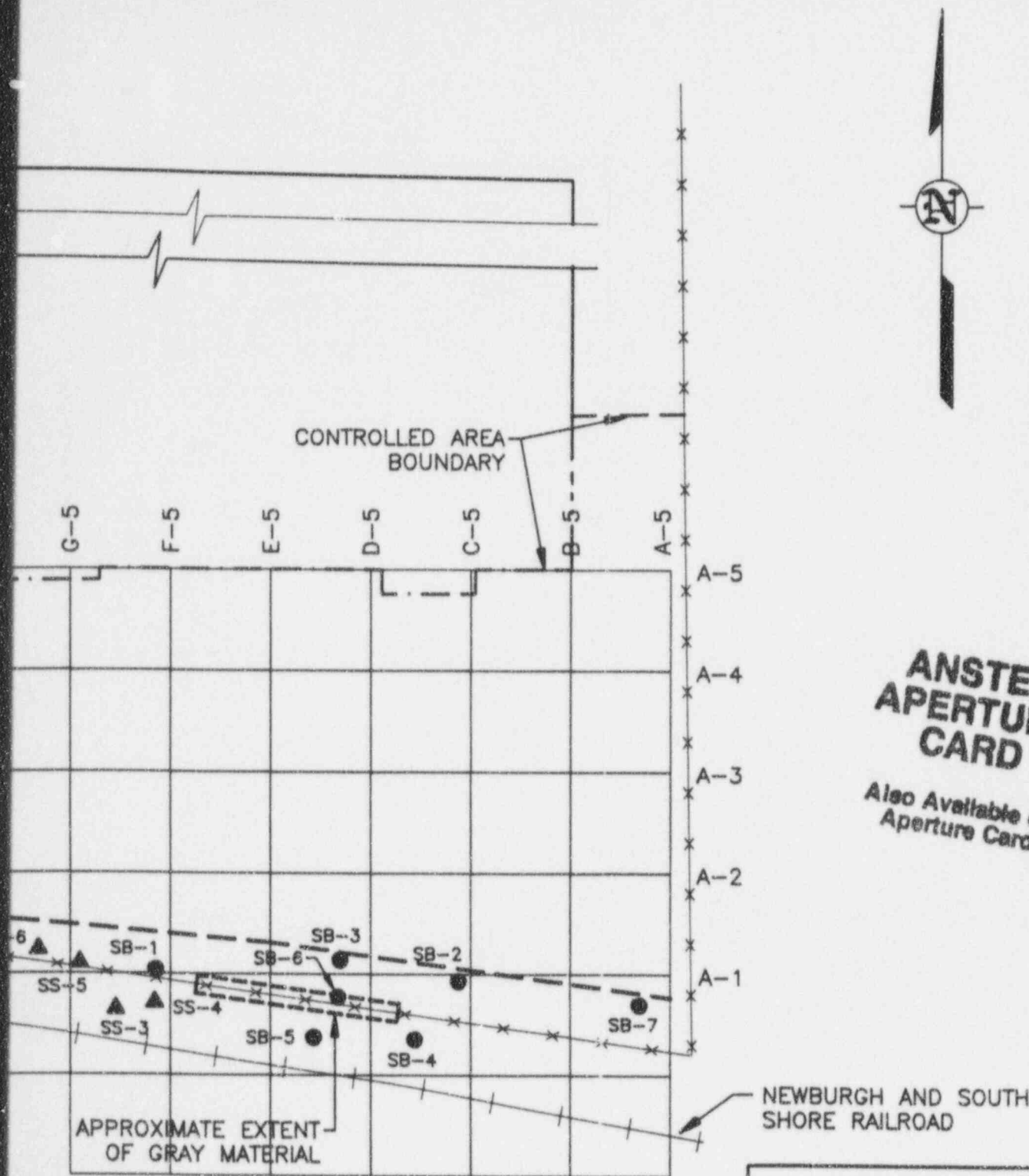




REFERENCE:

NUS, NOVEMBER 1989.





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LEGEND:

- SOIL BORING LOCATION
- ▲ SURFACE SAMPLE LOCATION

9707070419-01

FIGURE 2

SOIL BORING AND
SURFACE SAMPLE LOCATIONS

ALCOA
CLEVELAND WORKS

PREPARED FOR

ALCOA
CLEVELAND, OHIO



90249-B5

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NUMBER

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9/19/90

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BY

BUILDING 71

CONTROLLED AREA
BOUNDARY

ASSESSMENT AREA
BOUNDARY

NEWBURGH AND SOUTH
SHORE RAILROAD

SB-8
0.09

SS-1
0.95

OR-1
20.6

OR-3
15.5

OR-2
69.0

SS-6
0.05

SS-2
0.36

LEGEND:

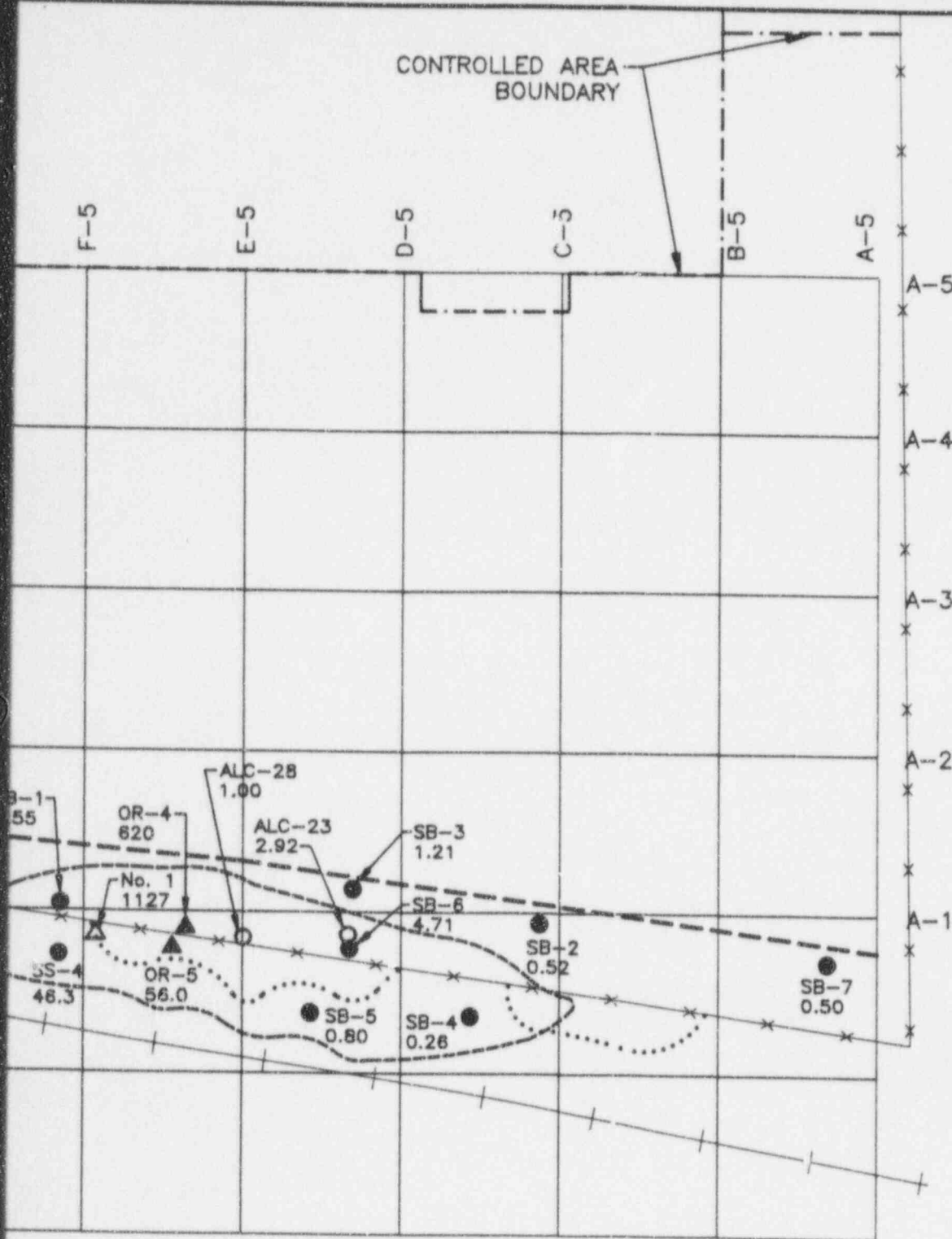
(ALL RESULTS IN pCi/g)

- SB CURRENT INVESTIGATION SOIL BORING SAMPLES, 0-2 FT
- SS CURRENT INVESTIGATION SURFACE SOIL SAMPLES
- ▲ OR ORAU 0"-6" SOIL SAMPLES
- ALC REMCOR STUDY (SPRING 1990) SURFACE SOIL SAMPLES
- △ No. SURFACE SOIL COLLECTED BY REMCOR (SPRING 1990)

REFERENCE:

NUS, NOVEMBER 1989.

CONTROLLED AREA
BOUNDARY



**ANSTEC
APERTURE
CARD**

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FIGURE 3

SURFACE SOIL SUMMARY OF TH-232
RESULTS FROM CURRENT AND
PREVIOUS INVESTIGATIONS

ALCOA - CLEVELAND WORKS
PREPARED FOR

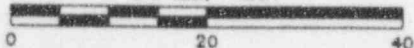
ALCOA
CLEVELAND, OHIO

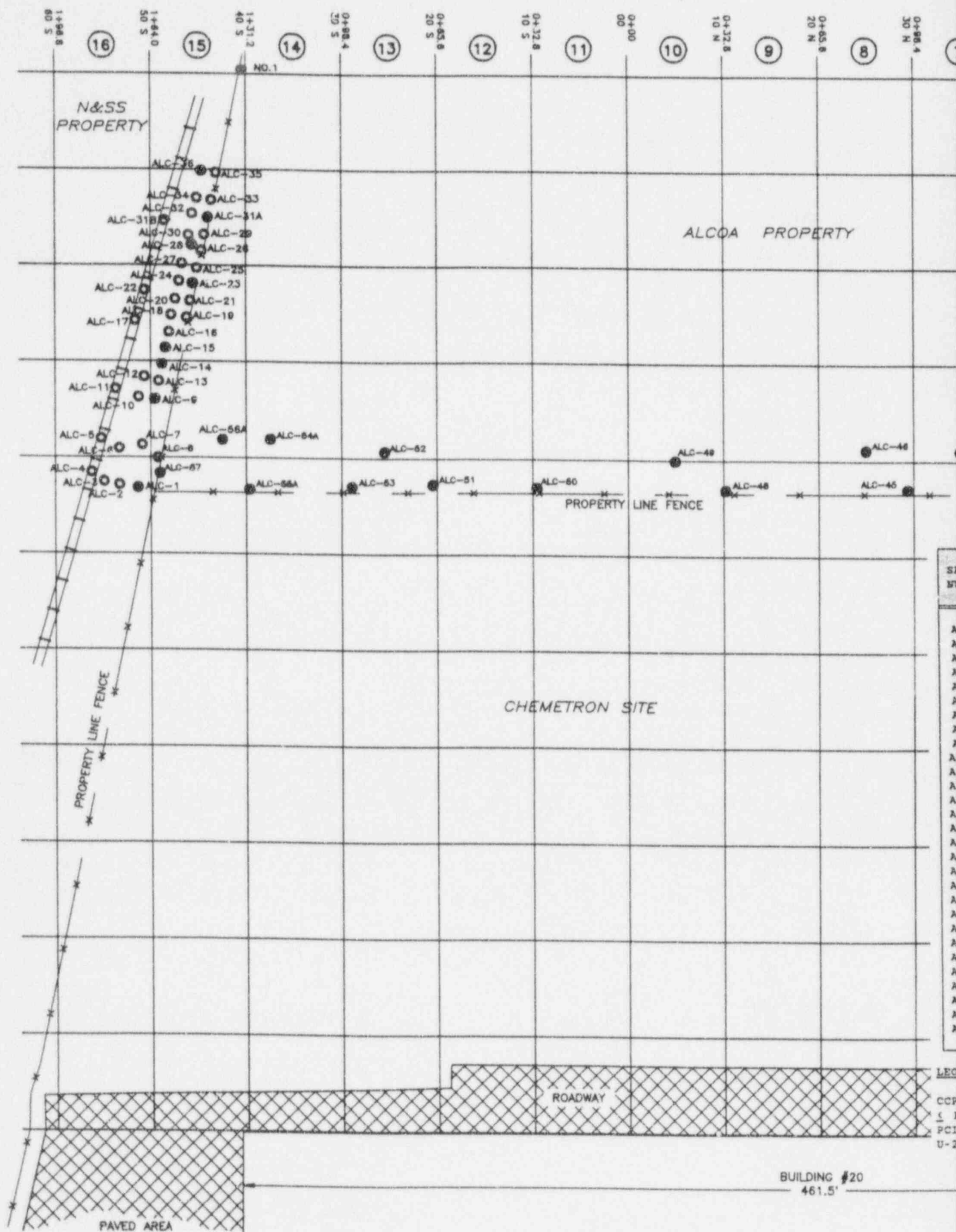
NUS INVESTIGATION TOTAL ENERGY
ISOPLETH $>15 \mu\text{rem/hr}$

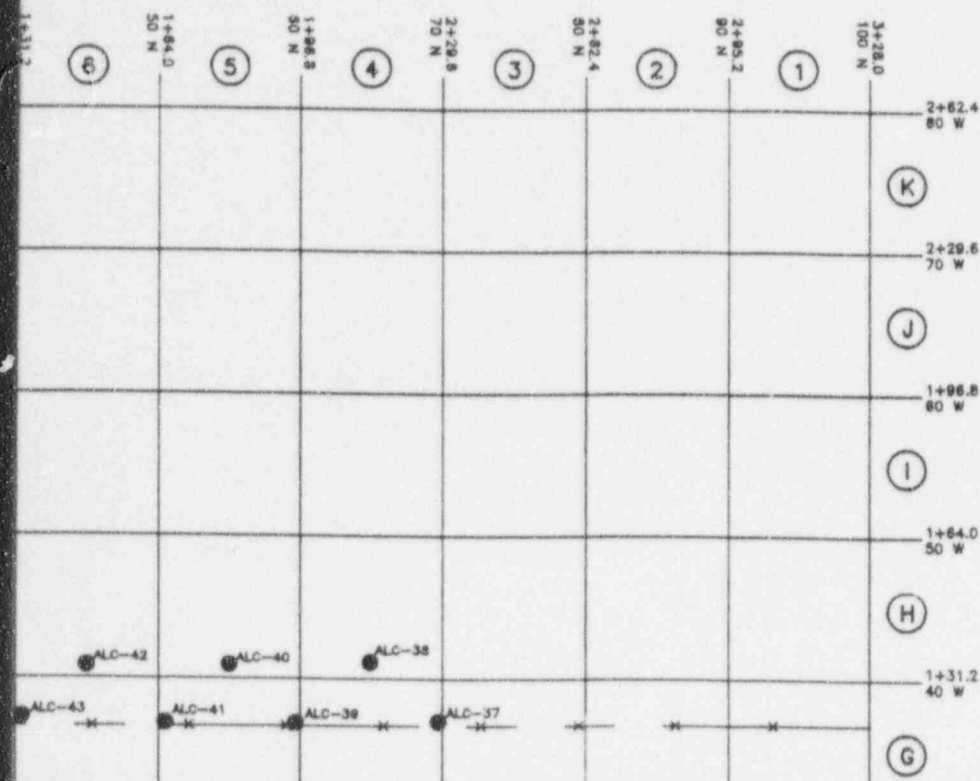
REMCOR STUDY (SPRING 1990)
ISOPLETH $>100 \text{ ccpm}$

9707070419-02

SCALE, FEET







LEGEND

- ALC-8 ○ SAMPLE LOCATIONS
- ALC-057 ● SAMPLES COLLECTED FOR GAMMA SPECTRAL ANALYSIS

NOTES:

- GRID SPACING IS 10 METERS BY 10 METERS (32.8 FT. BY 32.8 FT.)
- SAMPLES ALC-01 TO ALC-36 ARE SURFACE SAMPLES COLLECTED FROM 0'-6" DEPTH.
- SAMPLES ALC-037 TO ALC-57 ARE COMPOSITE SAMPLES COLLECTED FROM 0'-6" DEPTH.

FIELD COUNT (CCPM)	U-238 (PCI/GR)	THORIUM (PCI/GR)	SAMPLE NUMBER	FIELD COUNT (CCPM)	U-238 (PCI/GR)	THORIUM (PCI/GR)
500	292		ALC-30	60	--	
180	--		ALC-31A	200	< 35	
100	--		ALC-31B	50	--	
BKG	--		ALC-32	50	--	
BKG	--		ALC-33	300	--	
BKG	--		ALC-34	45	--	
120	--		ALC-35	50	--	
BKG	--		ALC-36	40	< 35	
180	167		ALC-37	50	< 35	
50	--		ALC-38	50	< 35	
BKG	--		ALC-39	50	< 35	
BKG	--		ALC-40	50	< 35	
120	--		ALC-41	50	< 35	
240	154		ALC-42	50	< 35	
740	69		ALC-43	50	< 35	
BKG	--		ALC-44	50	< 35	
BKG	--		ALC-45	50	< 35	
25	--		ALC-46	50	< 35	
50	--		ALC-48	50	< 35	
30	--		ALC-49	50	< 35	
60	--		ALC-50	50	< 35	
BKG	--		ALC-51	50	< 35	
240	< 35		ALC-52	50	< 35	
BKG	--		ALC-53	50	< 35	
300	--		ALC-54A	50	< 35	
600	--		ALC-55A	50	< 35	
50	--		ALC-56A	50	< 35	
180	< 35		ALC-57	50	< 35	
1,800	--		NO. 1	1000	< 35	1127

CORRECTED COUNTS PER MINUTE
LESS THAN OR EQUAL TO BACKGROUND
THORIUM PER GRAM
URANIUM 238

NORTHERN BOUNDARY
CONTAMINATED AREA
CHEMETRON SITE

**ANSTEC
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SCALE, FEET

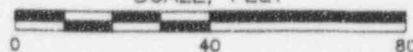


FIGURE 4

SAMPLE LOCATIONS
URANIUM SURVEY

ALCOA PROPERTY
HARVARD AVENUE SITE

PREPARED FOR

ALCOA
CLEVELAND WORKS

REMCOR

9707070419-03

DRAWING NUMBER 90249-B6

CHECKED BY C.E.B. 9/27/90

APPROVED

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BUILDING 71

CONTROLLED AREA
BOUNDARY

ASSESSMENT AREA
BOUNDARY

NEWBURGH AND SOUTH
SHORE RAILROAD

LEGEND:



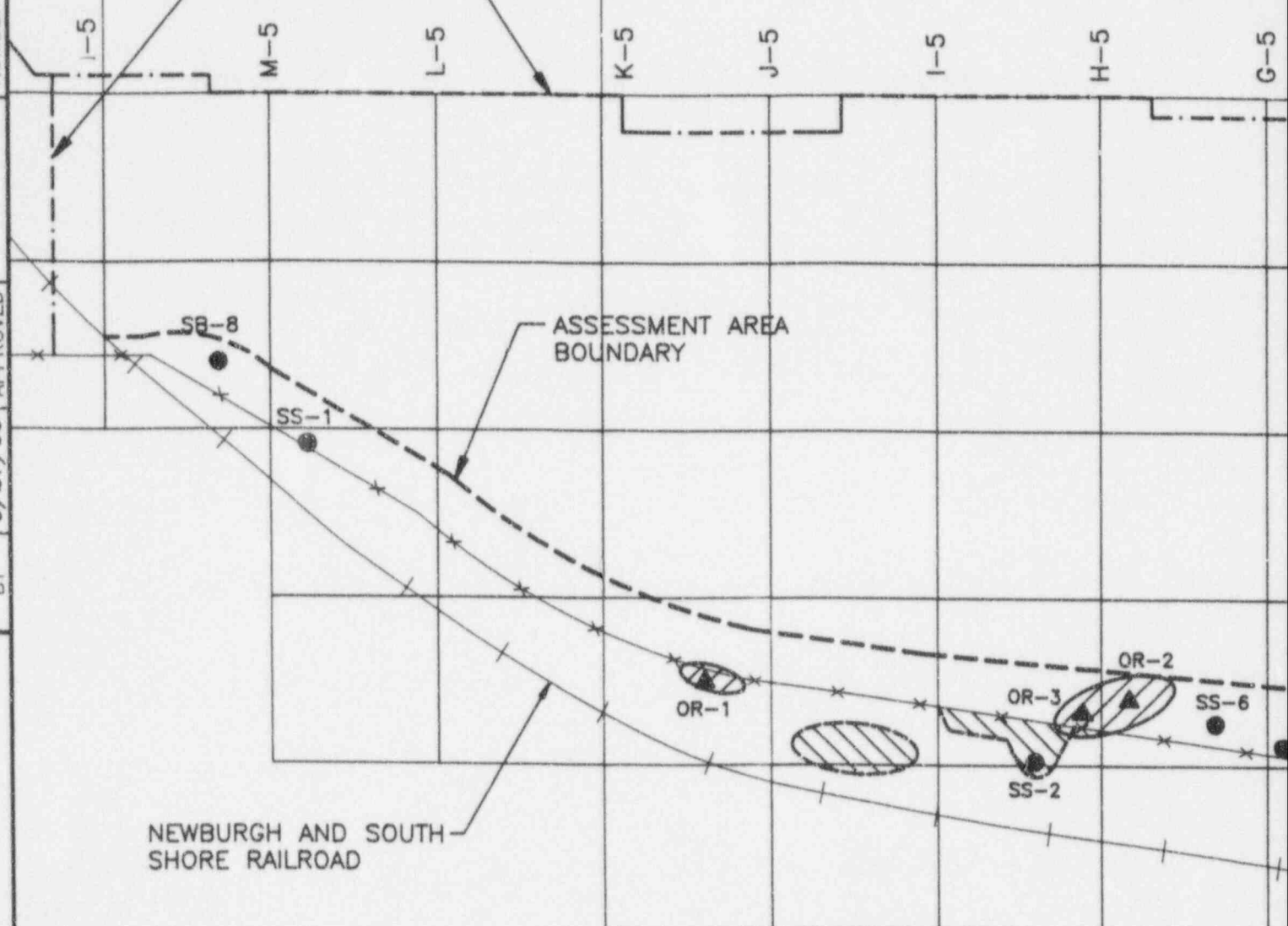
ESTIMATED AREAS OF SUSPECTED
TH-232 CONTAMINATION ($>15 \mu\text{rem/h}$
OR 100 ccpm) AS INDICATED ON
FIGURE 3 FROM INDIRECT MEASUREMENT
(i.e. FIELD SCREEN)

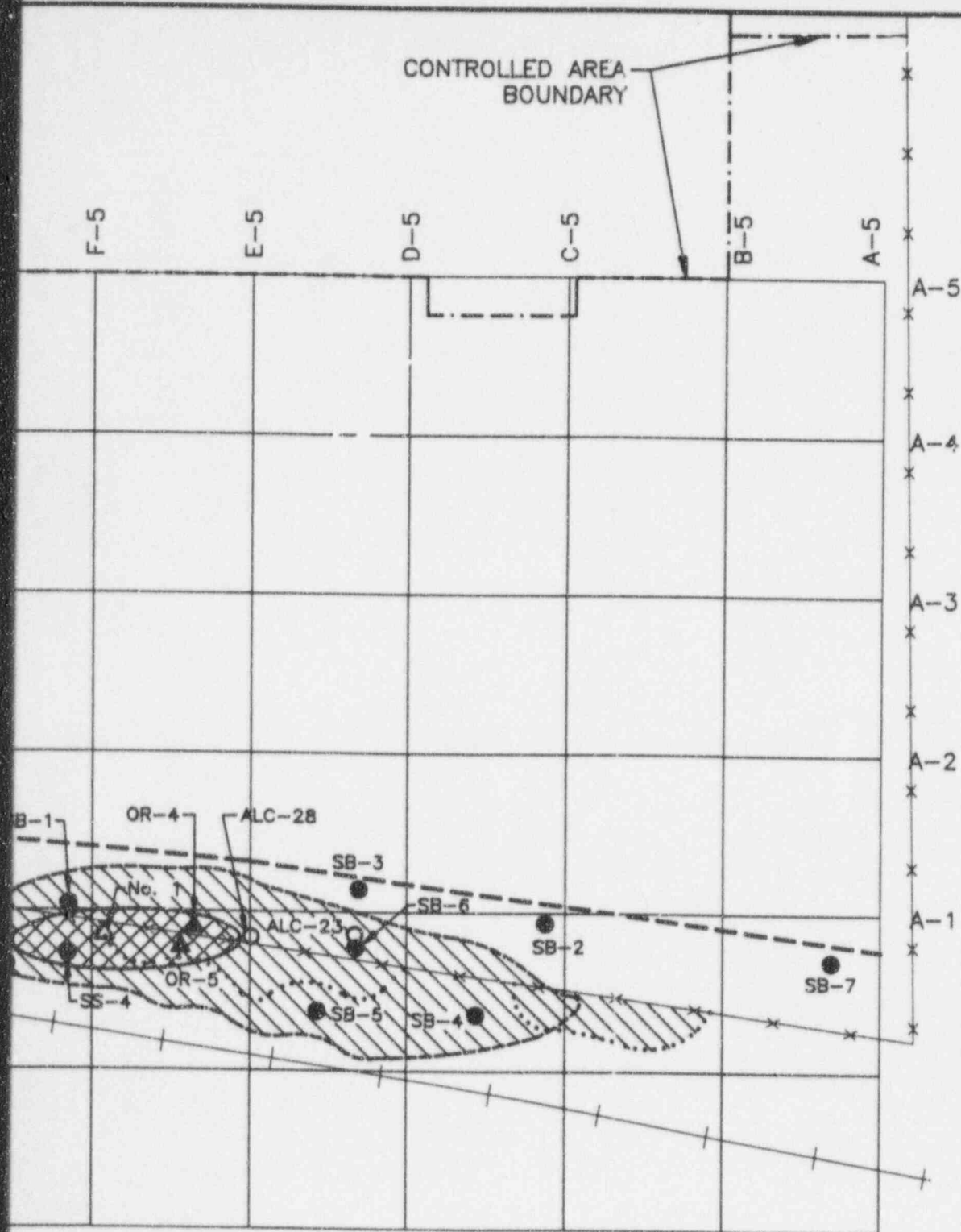


ESTIMATED AREAS OF TH-232
CONTAMINATION ($>10 \text{ pCi/g}$)
AS INDICATED BY ANALYTICAL
RESULTS

REFERENCE:

NUS, NOVEMBER 1989.





ANSTEC APERTURE CARD

Also Available on
Aperture Card

9707070419-04

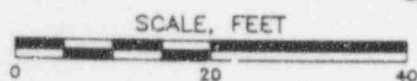


FIGURE 5

ESTIMATED AREA OF
TH-232 CONTAMINATION

ALCOA
CLEVELAND, OHIO


PREPARED FOR
ALCOA
CLEVELAND WORKS



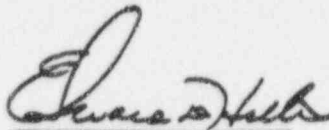
FOLLOW UP RADIATION SURVEY
OF THE
HARVARD AVENUE PROPERTY
FOR
ALUMINUM COMPANY OF AMERICA

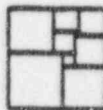
SUMMARY REPORT
NOVEMBER 1989

Prepared by:


Robert C. Looney
Principal Health Physicist

Approved by:


Edward D. Hollis, Manager
Radiation Protection and
Chemistry Services Department



NUS
CORPORATION

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P.O. BOX 8038
GAYTHESBURG, MARYLAND 20877-0888
(301) 256-8000

APPENDIX A
DATA FROM PREVIOUS INVESTIGATIONS

OAK RIDGE ASSOCIATED UNIVERSITIES INVESTIGATION

SEPTEMBER 1988

NOV 28 1988



Prepared by
Oak Ridge Associated
Universities

Prepared for
Division of
Industrial and
Medical Nuclear Safety

U.S. Nuclear
Regulatory
Commission

**CONFIRMATORY RADIOLOGICAL SURVEY
OF THE
HARVARD AVENUE PROPERTY
CHEMETRON CORPORATION
NEWBURGH HEIGHTS, OHIO**

J. D. BERGER

Radiological Site Assessment Program
Manpower Education, Research, and Training Division

**FINAL REPORT
SEPTEMBER 1988**

TABLE 10

RADIONUCLIDE CONCENTRATIONS IN SAMPLES COLLECTED
SOUTH OF THE ALCOA CASTING FACILITY
NEWBURGH HEIGHTS, OHIO

Location ^a	Depth (m)	Radionuclide Concentrations (pCi/g)		
		U-238	Th-232	Ra-226
37S, 95W	0-0.15	12.2 ± 4.7 ^a	20.6 ± 2.1	0.7 ± 0.5
	0.15-0.30	1.6 ± 1.9	2.2 ± 0.5	1.7 ± 0.3
	0.30-0.45	6.7 ± 4.4	4.8 ± 1.1	4.6 ± 0.6
41S, 79W	0-0.15	67.3 ± 4.8	69.0 ± 2.7	0.8 ± 0.7
	0.15-0.30	4.7 ± 2.1	12.8 ± 1.1	0.2 ± 0.4
42S, 81W	0-0.15	27.7 ± 3.0	15.5 ± 1.5	0.5 ± 0.5
45S, 65W	0-0.04	550 ± 20	620 ± 10	<1.5
	0.15-0.30	69.0 ± 7.4	92.2 ± 3.5	0.7 ± 0.8
	0.30-0.45	8.1 ± 4.5	13.1 ± 1.3	0.8 ± 0.4
46S, 65W	0-0.15	42.9 ± 5.1	56.4 ± 2.3	1.1 ± 0.6

^aUncertainties represent the 95% confidence levels, based only on counting statistics; additional laboratory uncertainties of ± 6 to 10% have not been propagated into these data.

NUS INVESTIGATION

NOVEMBER 1989

REMCOR DATA

SPRING 1990

"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"



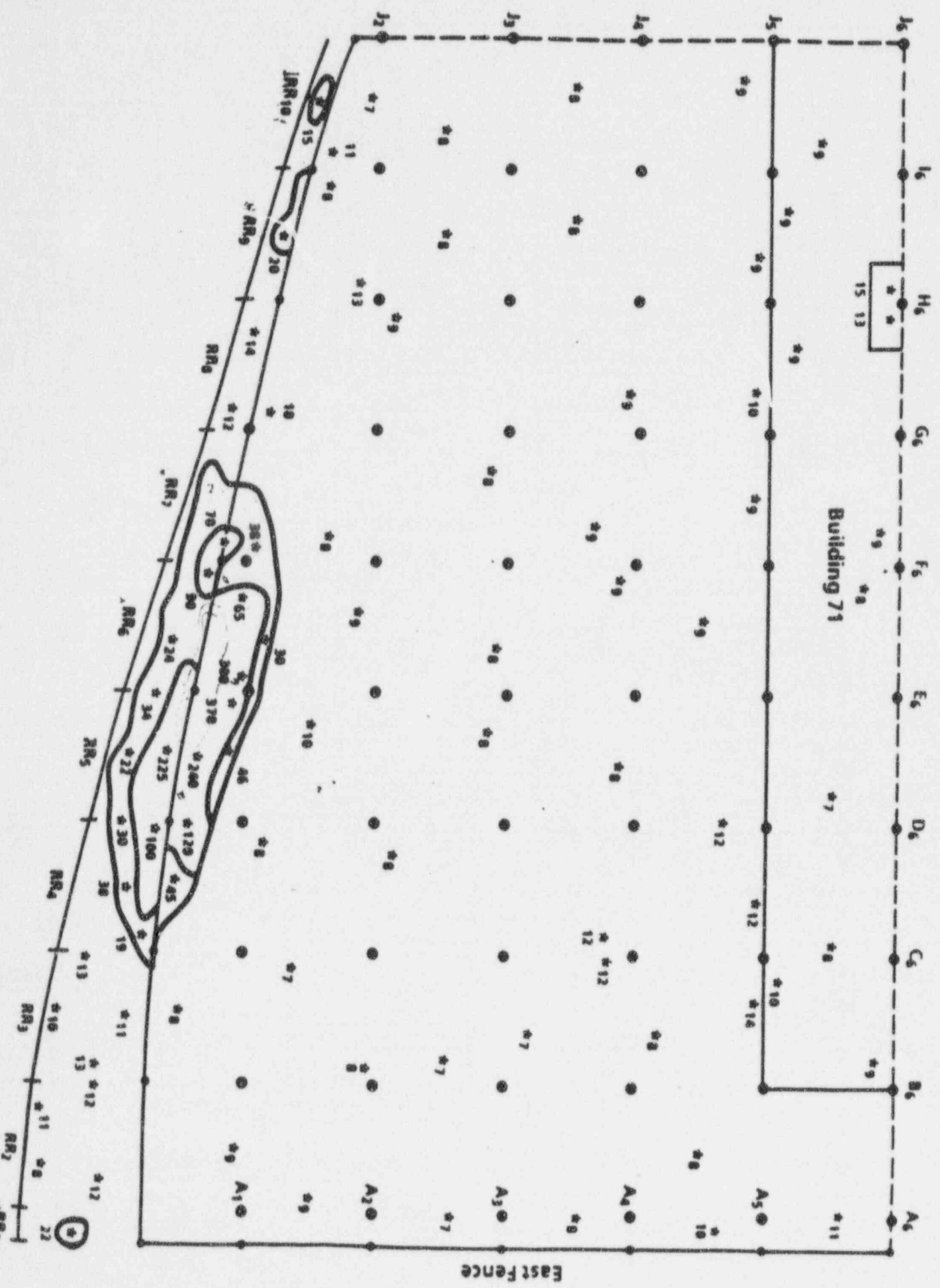


FIGURE 1 GRID MAP FOR INTENSE SURVEY



REMCOR, Inc. • 701 Alpha Drive • P.O. Box 38310 • Pittsburgh, PA 15238-8310 • 412-963-1106

November 8, 1990

Project No. 90249

Mr. Richard King
Environmental Engineering Supervisor
Aluminum Company of America
1600 Harvard Avenue
Cleveland, Ohio 44105

Letter Report
Uranium Survey of Alcoa Property
Adjacent to Chemetron Site
Cuyahoga Heights, Ohio

Dear Mr. King:

Remcor, Inc. (Remcor) is pleased to submit this letter report to the Aluminum Company of America (Alcoa) describing a uranium survey of a portion of the Cleveland Works. This survey was conducted and this report is being submitted under the terms of an access agreement granted by Alcoa on May 9, 1990. The survey was limited to an area of the southeast corner of the Cleveland Works immediately adjacent to the former Chemetron Investments, Inc. (Chemetron) site. The survey was conducted in late May 1990. Results of this survey do not indicate the presence of depleted uranium in the form of Uranium-238 on this portion of Alcoa's property.

This letter report summarizes this survey by describing the survey background, methods, and results. On specific instructions from Alcoa, this survey, and the resulting report, were limited to the area of Alcoa's property defined in the access agreement.

Survey Background

Under a source materials license issued by the U.S. Nuclear Regulatory Commission (NRC), Chemetron is responsible for decontaminating a formerly owned property in Cuyahoga Heights, Ohio. The contaminant of concern is depleted uranium in the form of Uranium-238 and its decay products. Chemetron's stated objectives in this decontamination effort have been unrestricted release of their formerly owned property and termination of their NRC license. Decontamination has been conducted under oversight and review by the NRC.

As part of their oversight role, the NRC directed that the decontamination program include surveys of areas adjacent to the west, south, and east boundaries of the property formerly owned by Chemetron. These surveys were intended to check for uranium transported beyond the boundaries of the original site by wind, surface runoff, or other mechanisms. The property to the west belongs to Alcoa and was included in this survey. The survey of the Alcoa property was conducted by Remcor under its contract with Chemetron and under the access authorization granted by Alcoa.

The initial survey area on Alcoa property was limited to a strip 25 feet wide along the property line between the Alcoa property and the Chemetron site. This strip extended approximately 490 feet along the boundary and included the whole length over which the Alcoa property and the unreleased portion Chemetron site are contiguous.

The initial survey area width of 25 feet was established with the verbal approval of the NRC, Alcoa, and Chemetron. Survey results indicating an absence of depleted uranium at specific activities exceeding NRC release criteria in the surface soils in this initial survey area are to be accepted as adequate evidence that depleted uranium from the Chemetron site had not been transported into Alcoa's property. If depleted uranium had been found at specific activities above NRC release criteria, the survey area would have been expanded to the west, further into Alcoa's property. Such a finding would have been evidence of contaminate migration from the Chemetron site, and the survey area would be expanded to define the limits of uranium contamination on Alcoa property.

Survey Methods

In late May 1990, Remcor conducted a uranium content survey of the surface soils on the area described above. This survey consisted of making shallow borings to a depth of six feet at 20 locations on Alcoa's property. These locations are identified in the attached Table 1 in terms of the Chemetron site grid system (metric) and in dimensions (in feet) north and west of the southeast fence corner of the Alcoa property. Sample locations are shown in Figure 1, attached to this letter.

The following procedures were used for boring, sample recovery, field screening, and sample analysis:

- Borings were made with a split-spoon sampler mounted on a threaded rod and driven by a tripod mounted drop hammer.

The boring was advanced in two-foot increments, the length of the split spoons, to a final depth of six feet. Three split spoons were recovered from each boring.

- For each two-foot increment, the split spoon was withdrawn from the hole and opened. The sample material in each spoon was scanned in the field with a beta-gamma survey meter.
- Split-spoon samples were cleaned by brushing and wiping between each use and between each boring to prevent cross-contamination between samples and borings.
- If the beta-gamma scans indicated sample portions with apparent elevated radiation, these portions were to be segregated for separate laboratory analysis. No such sample portions were encountered during the uranium survey on the Alcoa property.
- If the beta-gamma scans did not indicate sample portions with apparent elevated radiation, the contents of the split spoon were mixed with the material from the other two split-spoons from that boring. The three split-spoon samples from each boring were blended and split to provide a single composite sample representative of that boring. The field counts with the beta-gamma scanner for each composite sample were less than or equal to background readings in the vicinity of the Alcoa plant.
- A total of 20 samples, one composite from each boring, were collected during the field effort. These samples were transported from the Alcoa property to the Remcor field laboratory at Bert Avenue in Newburgh Heights.
- At the field laboratory, each sample was subjected to a gamma spectrum scan using a germanium crystal counter with a computer control and recording system. This counter records energy peaks over the spectrum of gamma radiation. These gamma radiation energy peaks were examined and correlated to estimate Uranium-238 based specific activity in each sample.

Survey Results

The survey results, in terms of the field instrument readings and the laboratory testing results, are reported in Table 2 and in Figure 1. These results are summarized as follows:

- Field instrument scan results, in corrected counts per minute (ccpm), were less than or equal to background readings for the project vicinity for the split-spoon samples tested in this survey.
- Laboratory analysis results indicate that the Uranium-238 specific activity was less than 35 pico-Curies per gram (pCi/g) for each of the samples tested in this survey. (The NRC criteria for unrestricted release for Uranium-238 is 35 pCi/g.)

The field and laboratory testing results for this uranium survey do not indicate the presence of Uranium-238 at specific activity levels above NRC unrestricted release criteria on this portion of the Alcoa property. These findings do not indicate that uranium has migrated or been transported into Alcoa property from the Chemetron site.

Closing

This report summarizes the uranium survey conducted by Remcor of a portion of Alcoa's property at the Cleveland Works. We trust that this report is clear and complete. If, however, you have any questions or need additional information, please do not hesitate to contact us. We appreciate Alcoa's support and cooperation in providing access so this survey could be conducted.

Respectfully submitted,

Earl H. Rothfuss

Earl H. Rothfuss, P.E.
Senior Project Manager

EHR:lem

TABLE 1

APPROXIMATE LOCATIONS OF SHALLOW BORINGS
URANIUM SURVEY OF ALCOA PROPERTY

BORING AND SAMPLE NUMBER	APPROXIMATE LOCATION (Chemetron Grid) *		APPROXIMATE LOCATION (from Alcoa's SE Fence Corner)	
			NORTH	WEST
ALC-37	70North	37West	366 feet	10 feet
ALC-38	65N	41W	350 feet	13 feet
ALC-39	60N	37W	335 feet	1 foot
ALC-40	55N	41W	320 feet	13 feet
ALC-41	51N	37W	306 feet	1 foot
ALC-42	45N	41W	290 feet	13 feet
ALC-43	41N	37W	276 feet	2 feet
ALC-44	35N	41W	259 feet	13 feet
ALC-45	29N	37W	242 feet	1 foot
ALC-46	25N	41W	228 feet	13 feet
ALC-48	10N	37W	183 feet	1 foot
ALC-49	5N	40W	167 feet	10 feet
ALC-50	9South	37W	123 feet	1 foot
ALC-51	21S	37W	89 feet	2 feet
ALC-52	26S	41W	74 feet	17 feet
ALC-53	28S	37W	63 feet	2 feet
ALC-54A	37S	42W	37 feet	17 feet
ALC-55A	40S	37W	35 feet	1 foot
ALC-56A	42S	42W	22 feet	17 feet
ALC-57	49S	38W	2 feet	6 feet

*The Chemetron grid is a matric system with locations measured in meters north and west of a base point.

TABLE 2

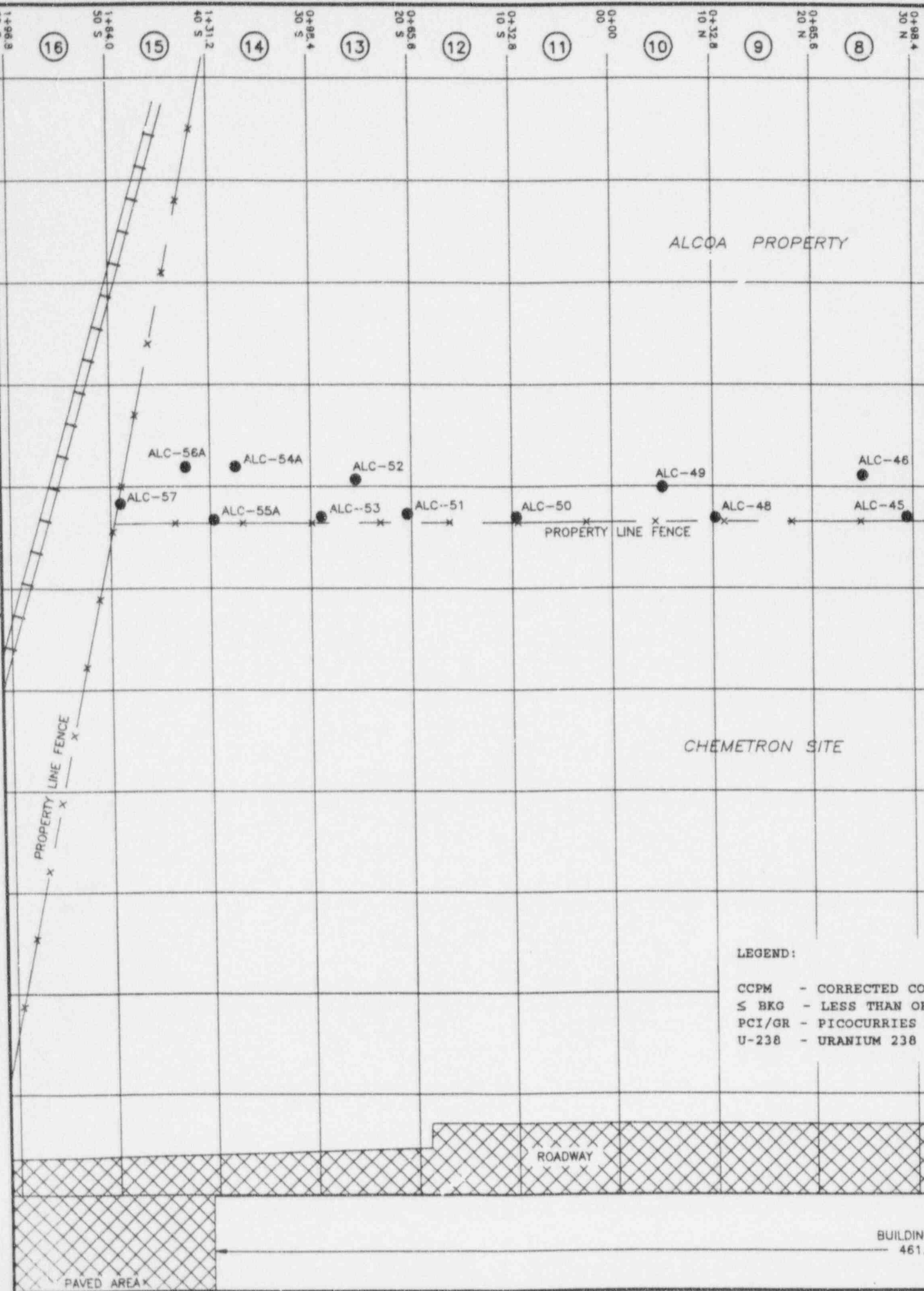
SUMMARY OF FIELD AND LABORATORY DATA
URANIUM SURVEY OF ALCOA PROPERTY

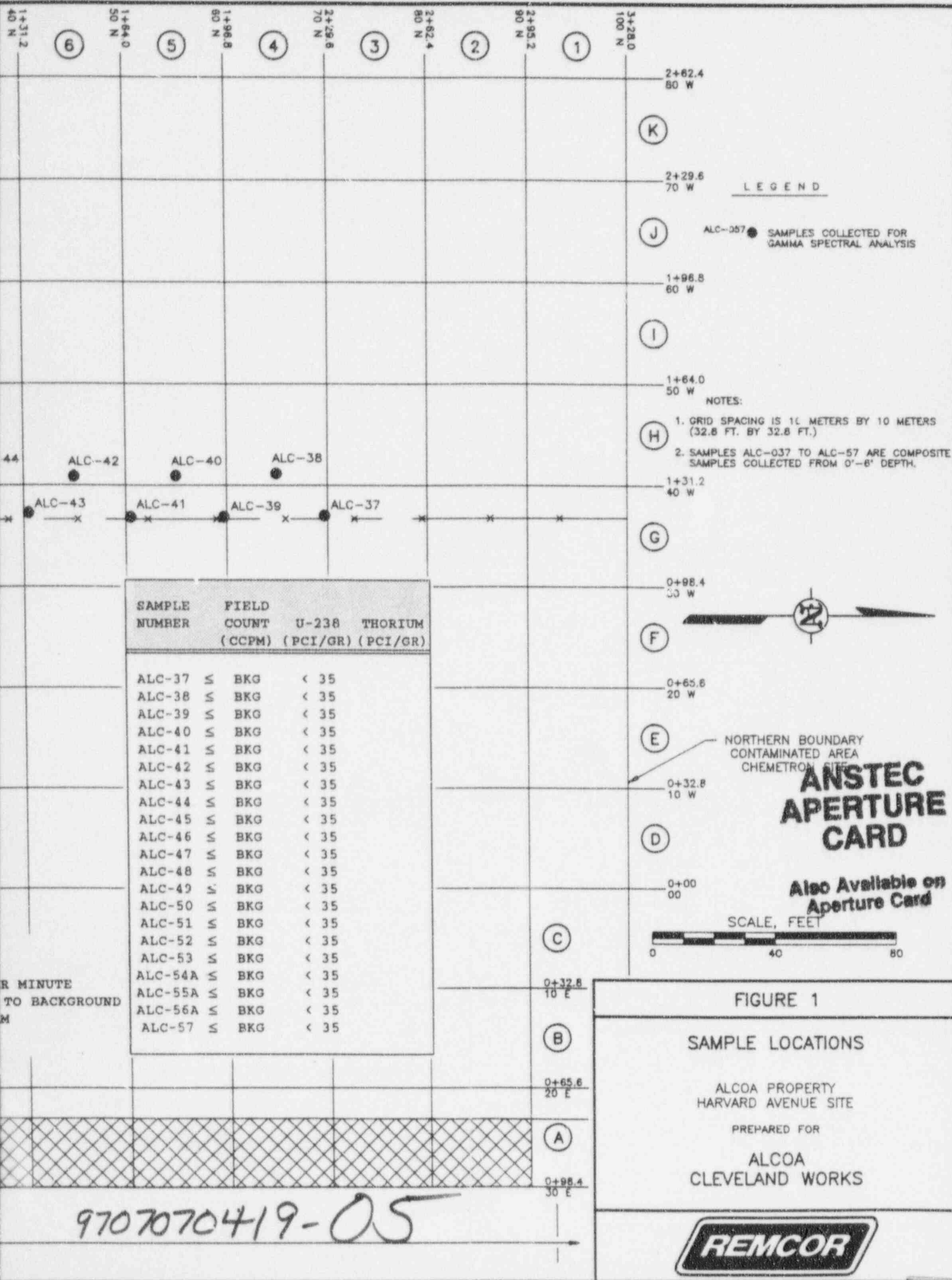
BORING AND SAMPLE NUMBER	FIELD SCAN RESULTS (ccpm)	LABORATORY RESULTS FOR URANIUM 238 ACTIVITY (pCi/g)
ALC-37	< background	<35
ALC-38	< background	<35
ALC-39	< background	<35
ALC-40	< background	<35
ALC-41	< background	<35
ALC-42	< background	<35
ALC-43	< background	<35
ALC-44	< background	<35
ALC-45	< background	<35
ALC-46	< background	<35
ALC-48	< background	<35
ALC-49	< background	<35
ALC-50	< background	<35
ALC-51	< background	<35
ALC-52	< background	<35
ALC-53	< background	<35
ALC-54A	< background	<35
ALC-55A	< background	<35
ALC-56A	< background	<35
ALC-57	< background	<35

DRAWING NUMBER 90249-B8

CHECKED BY L.H.K. 9/28/90

APPROVED BY





APPENDIX B

REMCOR INC. DAILY FOREMAN'S REPORTS

FOREMAN DAILY REPORT

PROJECT NO.: 90249 PROJECT NAME: Alcoa
DATE: 8/13/90 START TIME: 0900 FINISH TIME: 1210 WEATHER: RAINY
FOREMAN SIGNATURE: [Signature] SUPERINTENDENT SIGNATURE: [Signature]
PROJECT MANAGER: SHR

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS: Joe, Sanita & Dave Haloweiko arrived at gate 5 @ 0900 - met Mike Giazet, WES. Had Security attempt to reach Mark Gradert & Richard King with no success. Contacted Mark Gradert @ 0945. I called Miller. He informed me he'd be here by 1015. Miller, Rick Tasato, arrived @ 1040. We went to building 71 and conducted a safety meeting. Mark Gradert joined us at 1110. We used Cree @ 1200 and I left site at 1210. - Rain all morning.

ACCIDENTS: None

ACCIDENTS: None

IMPORTANT TELEPHONE CALLS: I called skip @ 0935. Informed him of status

MATERIALS RECEIVED: none

VISITORS ON SITE: none

SITE DAILY TIME SHEET								
EMPLOYEE	CLASS	TOTAL HOURS	TASKS					
			mob.	stand	stand by	Health and Safety		
Joe Senita		5 1/2	3		1	1 1/2		
Dave Holoweiko		4 1/2	2		1	1 1/2		
Mike Gunzel		2 1/2			1	1 1/2		
Driller		1 1/2				1 1/2		
Note: Stand by @ time when we could not reach our Alea contacts								



PROJECT NO.: 90249 PROJECT NAME: Alcoa
DATE: 8/14/92 START TIME: 8:00 FINISH TIME: 7:15 WEATHER: _____
FOREMAN SIGNATURE: [Signature] SUPERINTENDENT SIGNATURE: [Signature]
PROJECT MANAGER: [Signature]

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS: Today we installed 6 soil borings to 10ft. (B-1 - B-6). Field meters indicated relatively low activity. Met w/ Mark G. & Richard King @ 5:30 to discuss the results & what to do next. We signed a release order to allow us to conduct informal survey along face. Mike Ginzler ~~increased~~ increased view from that the survey is very informal & to not read too much into results. Mark G. directed us to all boring locations today.

ACCIDENTS: None

IMPORTANT TELEPHONE CALLS: spoke w/step @ 11:50 and son to discuss
status

MATERIALS RECEIVED:

VISITORS ON SITE: Frank Moxit, 2493 - pg 631 - 7:30 - Told me
to put 1" x 1/2" 5-10' North east-west of "contaminated" area. Also said he'd get
done. He said Mark G. checked utilities - none in area

SITE DAILY TIME SHEET

[illegible]

APPENDIX C
HEALTH AND SAFETY DATA

FIGURE 4
GROSS ALPHA/BETA ANALYSIS OF AIR PARTICULATES
ANALYSIS DATA SHEET

5B-1

SAMPLING DATA

Location: ALCOA 5278
Collected By: M. GZU?BL
Date/Time On: 8-14-90 0850
Date/Time Off: 8-14-90 0925

SAMPLE NO.: 001

Reason: COAL BOMB SUP.
Sampler ID: RASP 5897
Flow Rate (CFM) On: 1.475 E-2
Flow Rate (CFM) Off: 1.475 E-2

COUNTING DATA	ALPHA			BETA		
Counting System	L-2890	L-2890		L-2220	L-2220	
Serial Number	52823	52823		48409	48409	
Counting Date/Time	8-14/0930	8-17/1800		8-14/0854	8-17/1807	
Gross Counts	10	0		66	42	
Sample Count Time (Min)	1	1		1	1	
Gross Counts (cpm)	10	0		66	42	
Background counts	0	0		45	47	
Bkg Count Time (Min)	1	1		1	1	
Bkg Counts (cpm)	0	0		45	47	
Net Counts (cpm)	10	0		17	5826	
Counter Efficiency	.1	.1		.1	.1	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	1.155 E-4	1.155 E-4		1.105 E-4	1.155 E-4	
Activity (μCi/ml)	3.64 E-9	5.826		4.12 E-9	5.826	
Counting Error (μCi/ml)						
MDA (μCi/ml)						

Comments: COAL SURVEYED RESULTS NDA (NO MEASURABLE ACTIVITY)

Technician: M. GZU?BL
Reviewed by: _____

Date: 8-17-90
Date: _____

NOTE: $(113)(2.83E4) = ml$

Activity (μCi/ml) = (Net cpm) (Conv. Factor)/Counter Eff) Vol ml)

FIGURE 4

GROSS ALPHA/BETA ANALYSIS OF AIR PARTICULATES
ANALYSIS DATA SHEET

5B-2

SAMPLING DATA

Location: ALCOA SITE

Collected By: M. GIBB

Date/Time On: 8-14-90 0955

Date/Time Off: 8-14-90 1030

SAMPLE NO.: 002

Reason: CORE SURVEY

Sampler ID: RA30 5897

Flow Rate (CFM) On: 4.87E-2

Flow Rate (CFM) Off: 4.87E-2

COUNTING DATA	ALPHA			BETA		
Counting System	L-2220	L-2220		L-2220	L-2220	
Serial Number	52823	52823		48409	48409	
Counting Date/Time	8-14 1037	8-17 1410		8-14 1035	8-17 1415	
Gross Counts	7	0		69	50	
Sample Count Time (Min)	1	1		1	1	
Gross Counts (cpm)	7	0		69	50	
Background counts	0	0		45	47	
Bkg Count Time (Min)	1	1		1	1	
Bkg Counts (cpm)	0	0		45	47	
Net Counts (cpm)	7	0		24	3	
Counter Efficiency	.1	.1		.1	.1	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	1.9522E4	1.9522E4		1.9522E4	1.9522E4	
Activity (μCi/ml)	2.55E-9	5.8E-10		5.8E-9	2.2E-10	
Counting Error (μCi/ml)						
MDA (μCi/ml)						

Comments: CORE SURVEY RESULTS NDA

Technician: M. Gibb

Date: 8-17-90

Reviewed by: _____

Date: _____

NOTE: $(\text{ft}^3)(2.83\text{E}4) = \text{ml}$

Activity (μCi/ml) = (Net cpm) (Conv. Factor) / (Counter Eff) Vol ml

FIGURE 4
GROSS ALPHA/BETA ANALYSIS OF AIR PARTICULATES
ANALYSIS DATA SHEET

3E-3

SAMPLING DATA

Location: ALCOA SITE
Collected By: M. GANZEL
Date/Time On: 8-14-90 1100
Date/Time Off: 8-14-90 1130

SAMPLE NO.: 003

Reason: CORROSION SUR
Sampler ID: ASA 5897
Flow Rate (CFM) On: 1.17E-2
Flow Rate (CFM) Off: 1.47E-2

COUNTING DATA	ALPHA			BETA		
Counting System	C-2770	C-2770		C-2770	C-2770	
Serial Number	52823	52823		48409	48409	
Counting Date/Time	8-14 1140	8-17 1130		8-14 1145	8-17 1140	
Gross Counts	14	1		62	41	
Sample Count Time (Min)	1	1		1	1	
Gross Counts (cpm)	14	1		62	41	
Background counts	0	0		45	47	
Bkg Count Time (Min)	1	1		1	1	
Bkg Counts (cpm)	0	0		45	47	
Net Counts (cpm)	14	1		17	2	
Counter Efficiency	.1	.1		.1	.1	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	1.517E4	1.517E4		1.517E4	1.517E4	
Activity (μCi/ml)	1.0E-8	4.25E-10		5.47E-9	1.56E-9	
Counting Error (μCi/ml)						
MDA (μCi/ml)						

Comments: CORROSION SURVEYED RESULTS NDA

Technician: M. GANZEL
Reviewed by: _____

Date: 8-17-90
Date: _____

NOTE: $(11^3)(2.83E4) = ml$

Activity (μCi/ml) = (Net cpm) (Conv. Factor)/Counter Eff) Vol ml)

FIGURE 4

GROSS ALPHA/BETA ANALYSIS OF AIR PARTICULATES ANALYSIS DATA SHEET

SB-4

SAMPLING DATA

Location: ALCOA SITE

SAMPLE NO.: 004

Collected By: M. GENTEL

Reason: COALBONE SUP.

Date/Time On: 8-17-90 1417

Sampler ID: A450 5892

Date/Time Off: 8-17-90 1440

Flow Rate (CFM) On: 1.12 E-2

Flow Rate (CFM) Off: 1.12 E-2

COUNTING DATA	ALPHA			BETA		
Counting System	L-2220	L-2220		L-2220	L-2220	
Serial Number	5123	52823		41409	41409	
Counting Date/Time	8-17-90	8-17-90		8-17-90	8-17-90	
Gross Counts	5	0		65	45	
Sample Count Time (Min)	1	1		1	1	
Gross Counts (cpm)	5	0		65	45	
Background counts	0	0		45	47	
Bkg Count Time (Min)	1	1		1	1	
Bkg Counts (cpm)	0	0		45	47	
Net Counts (cpm)	5	0		20	≤ 846	
Counter Efficiency	.1	.1		.1	.1	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	1.11 E-4	1.11 E-4		1.11 E-4	1.11 E-4	
Activity (μCi/ml)	3.30 E-9	≤ 846		1.31 E-8	≤ 846	
Counting Error (μCi/ml)						
MDA (μCi/ml)						

Comments: COAL SURVEYED RESULTS IV 17 A.

Technician: [Signature]

Date: 8-17-90

Reviewed by: _____

Date: _____

NOTE: $(ft^3)(2.83E4) = ml$

Activity (μCi/ml) = (Net cpm) (Conv. Factor)/Counter Eff) Vol ml)

FIGURE 4

GROSS ALPHA/BETA ANALYSIS OF AIR PARTICULATES ANALYSIS DATA SHEET

SAMPLING DATA

Location: ALCOA SITE

Collected By: M. GENTEL

Date/Time On: 8-14-90 1500

Date/Time Off: 8-14-90 1531

SAMPLE NO.: 00 -

Reason: COAL DOME SURV.

Sampler ID: 4431 3892

Flow Rate (CFM) On: 1.12 L

Flow Rate (CFM) Off: 1.11 L

COUNTING DATA	ALPHA			BETA		
Counting System	C-2220	C-2220		C-2220	C-2220	
Serial Number	52123	52123		48409	48409	
Counting Date/Time	8-14 1542	8-17 1525		8-14 1545	8-17 1902	
Gross Counts	3	0		52	48	
Sample Count Time (Min)	1	1		1	1	
Gross Counts (cpm)	3	0		52	48	
Background counts	0	0		45	47	
Bkg Count Time (Min)	1	1		1	1	
Bkg Counts (cpm)	0	0		45	47	
Net Counts (cpm)	3	58K		7	1	
Counter Efficiency	.1	.1		.1	.1	
Conversion Factor	6.76E-7	6.76E-7	6.76E-7	4.5E-7	4.5E-7	4.5E-7
Volume (ml)	1.64E4	1.64E4		1.64E4	1.64E4	
Activity (uCi/ml)	1.12E-7	58K		2.19E-7	2.74E-10	
Counting Error (uCi/ml)						
MDA (uCi/ml)						

Comments: COAL DOME SURVEYED RESULTS NDA

Technician: mech/1.11

Date: 1-17-90

Reviewed by: _____

Date: _____

NOTE: $(113)(2.83E4) = ml$

Activity (uCi/ml) = (Net cpm) (Conv. Factor)/Counter Eff) Vol ml)

FIGURE 4

GROSS ALPHA/BETA ANALYSIS OF AIR PARTICULATES
ANALYSIS DATA SHEET

SAMPLING DATA

Location: ALCOA 5378

Collected By: M. GENTIL

Date/Time On: 8-14-90 1600

Date/Time Off: 8-14-90 1642

SAMPLE NO.: 900

Reason: COAL BARK SUP.

Sampler ID: ADP 5877

Flow Rate (CFM) On: 1.872-6

Flow Rate (CFM) Off: 1.876-6

COUNTING DATA	ALPHA			BETA		
Counting System	6-2220	6-2220		6-2220	6-2220	
Serial Number	58823	52823		44409	44409	
Counting Date/Time	8-14 1650	8-17 1905		8-14 1655	8-17 1910	
Gross Counts	5	0		60	50	
Sample Count Time (Min)	1	1		1	1	
Gross Counts (cpm)	5	0		60	50	
Background counts	0	0		45	47	
Bkg Count Time (Min)	1	1		1	1	
Bkg Counts (cpm)	0	0		45	47	
Net Counts (cpm)	5	0		15	3	
Counter Efficiency	.1	.1		.1	.1	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	2.22 E 4	2.22 E 4		2.22 E 4	2.22 E 4	
Activity (uCi/ml)	2.15 E -1	0		3.30 E -1	1.60 E -7	
Counting Error (uCi/ml)						
MDA (uCi/ml)						

Comments: COAL SURVEYED RESULTS NOA

Technician: M. GENTIL

Date: 8-17-90

Reviewed by: _____

Date: _____

NOTE: $(ft^3)(2.83E4) = ml$

Activity (uCi/ml) = (Net cpm) (Conv. Factor)/Counter Eff) Vol ml)

FIGURE 4

GROSS ALPHA/BETA ANALYSIS OF AIR PARTICULATES
ANALYSIS DATA SHEET

513-7

SAMPLING DATA

Location: ALCON SETE
Collected By: M. GENTEL
Date/Time On: 8-15-90 0830
Date/Time Off: 8-15-90 1024

SAMPLE NO.: 007

Reason: CORE CORE SUP

Sampler ID: 1A30 5817

Flow Rate (CFM) On: 1.17E-2

Flow Rate (CFM) Off: 1.17E-2

COUNTING DATA	ALPHA			BETA		
Counting System	L-2270	L-2270		L-2270	L-2270	
Serial Number	52423	52423		48409	48409	
Counting Date/Time	8-15	8-17 1990		8-15	8-17 1990	
Gross Counts	25	0		148	45	
Sample Count Time (Min)	1	1		1	1	
Gross Counts (cpm)	26	0		148	45	
Background counts	0	0		46	47	
Bkg Count Time (Min)	1	1		1	1	
Bkg Counts (cpm)	0	0		46	47	
Net Counts (cpm)	26	0		102	806	
Counter Efficiency	.1	.1		.1	.1	
Conversion Factor	6.76E-7	6.76E-7	6.76E-7	4.5E-7	4.5E-7	4.5E-7
Volume (ml)	6.03E4	6.03E4		6.03E4	6.03E4	
Activity (uCi/ml)	3.29E-9	5066		1.76E-9	5066	
Counting Error (uCi/ml)						
MDA (uCi/ml)						

Comments: CORE SURVEYED RESULTS NDA

Technician: M. GENTEL

Date: 8-17-90

Reviewed by: _____

Date: _____

NOTE: $(ft^3)(2.83E4) = ml$

Activity (uCi/ml) = (Net cpm) (Conv. Factor)/Counter Eff) Vol ml)

FIGURE 4

GROSS ALPHA/BETA ANALYSIS OF AIR PARTICULATES ANALYSIS DATA SHEET

SAMPLING DATA

Location: ALCOA SE7E
Collected By: M. GENTIL
Date/Time On: 8-15-90 13 10
Date/Time Off: 8-15-90 14 20

SAMPLE NO.: 008

Reason: COAL DUST SE7E SW
Sampler ID: RMS 5877
Flow Rate (CFM) On: 1.82 F-2
Flow Rate (CFM) Off: 1.82 F-2

COUNTING DATA	ALPHA			BETA		
Counting System	L-2220	L-2220		L-2220	L-2220	
Serial Number	52123	52123		48409	48409	
Counting Date/Time	4-15	8-17 1995		8-15	8-17 1995	
Gross Counts	30	0		147	42	
Sample Count Time (Min)	1	1		1	1	
Gross Counts (cpm)	30	0		147	42	
Background counts	0	0		46	47	
Bkg Count Time (Min)	1	1		1	1	
Bkg Counts (cpm)	0	0		46	47	
Net Counts (cpm)	30	0		101	6 BKG	
Counter Efficiency	11	1		11	11	
Conversion Factor	6.76 E-7	6.76 E-7	6.76 E-7	4.5 E-7	4.5 E-7	4.5 E-7
Volume (ml)	3.70 E-4	3.70 E-4		3.70 E-4	3.70 E-4	
Activity (μCi/ml)	1.54 E-9	≤ BKG		1.12 E-8	≤ BKG	
Counting Error (μCi/ml)						
MDA (μCi/ml)						

Comments: COAL DUST SURVEYED RESULTS NDA

Technician: Michael E. Smith
Reviewed by: _____

Date: 8-17-90

Date: _____

NOTE: $(11^3)(2.83E4) = ml$

Activity (μCi/ml) = (Net cpm) (Conv. Factor)/Counter Eff) Vol ml)



CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.

POST OFFICE BOX 810

PH. 915-235-5494

501 OAK STREET

FAX NO. (915) 235-4672

SWEETWATER, TEXAS 79556, U. S. A.

CUSTOMER NESMfg. LudlumModel 2220ORDER NO. 150397Mfg. LudlumDist. Model 44-9Serial No. 48409Cal. Date 6-1-90Cal. Due Date 6-1-91Serial No. PRO 42929Cal. Interval 1 yr METERFACE 202-159

Check mark (✓) applies to applicable instr. and/or detector IAW mfg. spec. s.

☐ Det. (Alpha) Bkgnd

cpm

☒ Det. Oper. V900

V at

6.5

MV

☐ New InstrumentT 75 °F RH 57 %A't 6988

mm Hg

☒ F/S Resp. ck☒ Zero Reset ck.☒ Audio ck.☒ Meter Zeroed☒ Bat. ck. (Min. Volt)4.20

VDC

☐ Bat. Volt

VDC

Instrument Volt Set

900

V

☒ Threshold Dial100

= Input Sens

10

mV.

☐ Input Sens Linearity☒ HV Readout (2 points)

Ref./Inst.

500504

V

Ref./Inst.

20002000

V

☐ Alarm Setting ck.☒ Window Operation☐ Background subtract☒ Mechanical ck.

Repair Instrument Received:

☐ Within Toler. + -10%☐ 10-20%☐ Out Toler.☒ Requiring Repair

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M. 44-9 in which the back of probe faces source

RANGE MULTIPLIER

REFERENCE
CAL. POINTINSTRUMENT
METER READINGINSTRUMENT REC'D
"AS FOUND READING"

X	1K
X	"
X	100
X	"
X	10
X	"
X	1
X	"
X	
X	
X	

400K cpm
100K "
40K "
10K "
4K "
1K "
400 "
100 "

400
100
400
100
400
100
400
100

N/A

All

Range(s) Calibrated Electronically

Digital
ReadoutReference Cal. Point
400K cpm, 40K cpm, 4K cpm, 400 cpmLog
Scale

1500K cpm, 50K cpm, 5K cpm, 500 cpm

Instrument Meter Reading

400,015, 4000, 4,000, 400, 1500K, 50K, 5K, 500

"As Found Reading"

N/A, N/A

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Bureau of Standards, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants, or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of MIL-STD-45663A and ANSI N323-1978.

☒ Cs137 Gamma s/n 1182

6-112

☐ Neutron Am-241 Be s/n T-304

State of Texas Calibration License No. LO-1943

☐ Alpha s/n☐ Beta s/n☐ Other☒ M-500 s/n 54668

"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"

☐ Oscilloscope s/n☒ Multimeter s/n 35068861Calibrated By: Bill HensonDate 6-1-90



915 - 235-5494 - 235-4947 TELEX No. 466832 UD
POST OFFICE BOX 810 FAX NO. (915) 235-4672

501 OAK STREET

SWEETWATER, TEXAS, U. S. A. 79556



CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.

POST OFFICE BOX 810

PH. 915-235-5494

501 OAK STREET

FAX NO. (915) 235-4672

SWEETWATER, TEXAS 79556, U. S. A.

CUSTOMER NESMfg. LudlumModel 2220ORDER NO. 150397Mfg. LudlumDet. Model 43-5Serial No. 52823Cal. Date 6-1-90Cal. Due Date 6-1-91Serial No. PR037504Cal. Interval 1yr METERFACE 202159

Check mark (✓) applies to applicable instr. and/or detector IAW mfg. spec. s.

☐ Det. (Alpha) Bkgnd _____ cpm ☒ Det. Oper. V 600 V at 10 ☐ New InstrumentT 75 °F RH 57 % Alt 6988 mm Hg ☒ F/S Resp. ck ☒ Zero Reset ck ☒ Audio ck ☒ Meter Zeroed☒ Bat. ck. (Min. Volt) 4.20 VDC ☐ Bat. Volt _____ VDC Instrument Volt Set 600 V☒ Threshold Dial 100 = Input Sens 10 mV. ☐ Input Sens Linearity☒ HV Readout (2 points) Ref./Inst. 500 , 507 V Ref./Inst. 2000 , 2006 V☐ Alarm Setting ck. ☒ Window Operation ☐ Background subtract ☒ Mechanical ck.Repair Instrument Received: ☐ Within Toler. + -10% ☐ 10-20% ☐ Out Toler. ☒ Requiring Repair

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M. 44-B in which the back of probe faces source.

RANGE MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT METER READING	INSTRUMENT REC'D "AS FOUND READING"
X <u>1K</u>	<u>400K cpm</u>	<u>400</u>	<u>N/A</u>
X <u>"</u>	<u>100K "</u>	<u>100</u>	<u>N/A</u>
X <u>100</u>	<u>40K "</u>	<u>400</u>	<u>N/A</u>
X <u>"</u>	<u>10K "</u>	<u>100</u>	<u>N/A</u>
X <u>10</u>	<u>4K "</u>	<u>400</u>	<u>N/A</u>
X <u>"</u>	<u>1K "</u>	<u>100</u>	<u>N/A</u>
X <u>1</u>	<u>400 "</u>	<u>400</u>	<u>N/A</u>
X <u>"</u>	<u>100 "</u>	<u>100</u>	<u>N/A</u>
X _____	_____	_____	_____
X _____	_____	_____	_____
X _____	_____	_____	_____

Digital Readout	Reference Cal. Point	Instrument Meter Reading	Range(s) Calibrated Electronically
<u>1400K cpm</u>	<u>140K cpm</u>	<u>1400, 152</u>	<u>N/A</u>
<u>140K cpm</u>	<u>4K cpm</u>	<u>400, 30</u>	<u>N/A</u>
<u>4K cpm</u>	<u>400 cpm</u>	<u>4, 001</u>	<u>N/A</u>
<u>400 cpm</u>		<u>400</u>	<u>N/A</u>
		<u>1550K</u>	<u>N/A</u>
		<u>50K</u>	<u>N/A</u>
		<u>4.6K</u>	<u>N/A</u>
		<u>500</u>	<u>N/A</u>

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Bureau of Standards, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants, or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of MIL-STD-45662A and ANSI N223-1978.

☐ Cs137 Gamma s/n 1162 ☐ Neutron Am-241Be s/n T-304 State of Texas Calibration License No. LO-1963☐ Alpha s/n _____ ☐ Beta s/n _____ ☐ Other _____☒ M-500 s/n 54668 ☐ Oscilloscope s/n _____ ☒ Multimeter s/n 35060861Calibrated By: Bill Henson Date 6-1-90Reviewed By: [Signature] Date 6-4-90

Form 22 - 3-90

"REALISTIC SOLUTIONS FOR HAZARDOUS WASTE PROBLEMS"

REMCOR

DESIGNER AND MANUFACTURER
OF
Scientific and Industrial
Instruments



LOUDLUM MEASUREMENTS, INC.

915 - 235-5484 - 235-4947 TELEX No. 486832 CD
POST OFFICE BOX 810 FAX NO. (915) 235-4672
501 OAK STREET
SWEETWATER, TEXAS, U. S. A. 79556

Bench Test Data For Detector 43-5 S/N PRO37504
Customer NES Order No. 150397
Counter 2220 S/N 52823 Distance-Source to Detector SURFACE
Count Time CPM Counter Input Sensitivity 10 MV
Isotope TH-230 S/N 1619 Size 3389 cpm Other _____

43-4/43-44 HV ADJ FOR ALTITUDE

ALT.	HIGH VOLTAGE
Sea Level	2050 V
1000 foot	2025 V
2000 foot	2000 V
3000 foot	1975 V
4000 foot	1950 V
5000 foot	1925 V
6000 foot	1900 V
7000 foot	1875 V

ALPHA SCINTILLATION DETECTOR

HV Plateau	Background	Source Count
450	0	4
500	0	538
550	0	819
600	0	863
650	3	874
700	18	885
750	139	1076

OPERATING VOLTAGE SET AT 600 V

AIR PROPORTIONAL	(43-5)	43-65	BACKGROUND	METER READING	RANGE/SCALE
///	Toe	L/S *	0	830	1 min. C.M.T.
	Center	Center	0	863	1 min. C.M.T.
///	Heel	Other	0	851	1 min. C.M.T.

☒ Uniformity (+ 10%) Ave. Efficiency 25 %

* Least Sensitive Position (Heel Of Probe)

** Opposite Least Sensitive Position (Top Of Probe)

Date 6-2-90 Signature Bill Henson

ILD ASSIGNMENT

	ROSEMETERS	INITIAL URINALYSES	FINAL
JOE SENIYA	99004	P01	P08
MICHAEL GINZEL	99005	P02	P09
DAVID HOLOWEIKO	99006	P03	P10
DAVE DUNDR	99008	P04	P11
RICK TOSATTO	99007	P05	P12 P12
BKG BY VEHICLES	99009	P06	P13
BKG BY FENCE	99000	P07	P14

ATTEND. FOR BRIEFING
OF RADIOLOGICAL HAZARDS.
SIGN NAME PAINT 8-13-90

Michael E. Ginz	MICHAEL GINZEL	S.F. 316-74-5212
David S. Holoweiko	DAVID HOLWEIKO	202-56-2355
David E. Dundr	DAVID E. DUNDR	283-44-9544
Rich M. Tosatto	Rich. M. Tosatto	278-64-8607
Joe Senita	Joe Senita	191-42-6787

APPENDIX D

SOIL BORING AND SURFACE SOIL SAMPLE DESCRIPTION LOGS

REMCOR

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 90249	PROJECT NAME: ALCOA	DATE: 8/20/90
BORING NUMBER: SB-1	DRILLING METHOD: HOLLOW STEM AUGER	DATE STARTED: 8/14/90
PAGE 1 OF 1	ENGINEER/GEOLOGIST: JAS	DATE COMPLETED: 8/14/90

Depth	Sample Type/No.	Blow Count	Recovery	Description	USCE Symbol	ENa Results (ppm)	Data/Comments Results (CCPM)
02		3/3/3/3	40%	Surface grass covered black loam-brown silty clay-green crystals	EM	BKG	NDA
24		3/3/3/2	30%	Brown Clay moist	CL	BKG	NDA
46		8/14 12/1	40%	Cinders w/some silty clay fall rapidly @ 5 1/2 ft.	GC	BKG	NDA
		2/2/2/2	0%				
810		4/5/5/5	45%	Brown silty clay more plastic than shallower depths	CH	BKG	NDA
				TOTAL DEPTH 10FT.			

NOTES:

BKG- Background

NDA- No detectable activity greater than background

REMCOR

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 90241249	PROJECT NAME: ALCOA	DATE: 8/20/90
BORING NUMBER: SB-2	DRILLING METHOD: HOLLOW STEM AUGER	DATE STARTED: 8/14/90
PAGE 1 OF 1	ENGINEER/GEOLOGIST: JAS	DATE COMPLETED: 8/14/90

Depth	Sample Type/No.	Blow Count	Recovery	Description	USCS Symbol	HMU Results (ppm)	Basic/Gravel Results (CCPM)
2		2/2 5/15	30%	Black loam 0-6' black cinders	SM GL	BKG	NDA
4		2/2 1/1	50%	Fine sand silt some gravel size material	CL	BKG	NDA
6		2/2 2/3	25%	Brown silty clay	CL	BKG	NDA
8		4/5 6/6	70%	8' Brown silty clay trace fine gray-green sand size material 8' Fine sand & silt size material gray-green/aqua colored	SM	BKG	NDA
10		4/4 5/7	50%	Dark brown & black fine sand moist bottom of sample almost saturated	SM	BKG	NDA
12				TOTAL DEPTH 10FT.			

NOTES:

REMCOR

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 90249	PROJECT NAME: ALCOA	DATE: 8/20/90
BORING NUMBER: SB-4	DRILLING METHOD: HOLLOW STEM AUGER	DATE STARTED: 8/14/90
PAGE 1 OF 1	ENGINEER/GEOLOGIST: JAS	DATE COMPLETED: 8/14/90

Depth	Sample Type/No.	Blow Count	Recovery	Description	USCE Symbol	HNu Results (ppm)	Data/Gamma Results (CCPM)
2	02	2/2/2/2	60%	Black cinders & brown clayey sand	GC	BKG	NDA
4	24	2/2/3/3	50%	Brown clayey sand black cinders	GC	BKG	NDA
6	46	3/5/7/7	20%	top 2" black cinders 6" brown silty clay	GC	BKG	NDA
8	66	3/3/2/3	10%	Black cinders	GC	BKG	NDA
10	810	3/3/3/3	100%	8" black cinders 16" coarse tan sand	GC SP	BKG	NDA
12				TOTAL DEPTH 10FT.			

NOTES:

BKG- Background

NDA- No detectable activity

REMCOR

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 90249	PROJECT NAME: ALCOA	DATE: 8/20/90
BORING NUMBER: SB-5	DRILLING METHOD: HOLLOW STEM AUGER	DATE STARTED: 8/14/90
PAGE 1 OF 1	ENGINEER/GEOLOGIST: JAS	DATE COMPLETED: 8/14/90

Depth	Sample Type/No.	Blow Count	Recovery	Description	USCS Symbol	RN _u Results (ppm)	Beta/Gamma Results (CCPM)
0	02	2/3/3/3	100%	Black cinders	GC	BKT	NDA
2	24	4/8 22/26	5%	Large black cinders	GC	BKG	NDA
4	46	7/12 21/14	90%	9" Black cinders 8" tan clayey coarse sand sand	GC SM	BKG	NDA
6	68	3/4/3/3	20%	Black cinders	GC	BKG	NDA
8	810	4/4/3/2	100%	Black cinders	GC	BKG	NDA
10							
12				TOTAL DEPTH 10FT.			

NOTES:

REMCOR

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 90249	PROJECT NAME: ALCOA	DATE: 8/20/90
BORING NUMBER: SB-6	DRILLING METHOD: HOLLOW STEM AUGER	DATE STARTED: 8/14/90
PAGE 1 OF 1	ENGINEER/GEOLOGIST: JAS	DATE COMPLETED: 8/14/90

Depth	Sample Type/No.	Blow Count	Recovery	Description	USCS Symbol	HNu Results (ppm)	Bato/Gamma Results (CCPM)
0.5	02	5/3/2/1	50%	Gray dust	SM	BKG	500
2				Black cinders with gray and brown sandy fill material	GC	BKG	NDA
24		3/5/2/2	50%	3' gray sandy material @top - 9' brown clay sand fill	SM	BKG	NDA
46		1/1/1/1	40%	Brown clay to brown clays, sand coursening into cinders	CL CH GC	BKG	NDA
68		2/1/1/1	50%	Black course cinders	GC	BKG	NDA
810		1/2/2/2	45%	Brown & black cinders trace sandy clay	GC	BKG	NDA
12				TOTAL DEPTH 10FT.			

NOTES:

REMCOR

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 90249	PROJECT NAME: ALCOA	DATE: 8/20/90
BORING NUMBER: SB-7	DRILLING METHOD: HOLLOW STEM AUGER	DATE STARTED: 8/15/90
PAGE 1 OF 1	ENGINEER/GEOLOGIST: JAS	DATE COMPLETED: 8/15/90

Depth	Sample Type/No.	Blow Count	Recovery	Description	USCS Symbol	RNn Results (ppm)	Beta/Gamma Results (CCPM)
02		11/3 3/6	10%	Brick fragments & cinders	GC	BKG	NDA
24		3/3/4/1	60%	Black cinders grading to brown clay @ base	GC CL	BKG	NDA
46		3/4/3/3	20%	Black cinders-moist	GC	BKG	NDA
66		3/3/3/2	75%	Brown silty clay	CH	BKG	NDA
810		3/3/3/3	90%	Brown silty clay-saturated	CH	BKG	NDA
				TOTAL DEPTH 10FT.			

NOTES:

REMCOR

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 90249	PROJECT NAME: ALCOA	DATE: 8/20/90
BORING NUMBER: SB-6	DRILLING METHOD: HOLLOW STEM AUGER	DATE STARTED: 8/14/90
PAGE 1 OF 1	ENGINEER/GEOLOGIST: JAS	DATE COMPLETED: 8/14/90

Depth	Sample Type/No.	Blow Count	Recovery	Description	USCS Symbol	HMu Results (ppm)	Beta/Gamma Results (CCPM)
0.5	02	5/3/2/1	50%	Gray dust	SM	BKG	500
2				Black cinders with gray and brown sandy fill material	GC	BKG	NDA
4	24	3/5/2/2	50%	3' gray sandy material @top - 9' brown clay sand fill	SM	BKG	NDA
6	46	1/1/1/1	40%	Brown clay to brown clayey sand coarsening into cinders	CL CH GC	BKG	NDA
8	66	2/1/1/1	50%	Black coarse cinders	GC	BKG	NDA
10	810	1/2/2/2	45%	Brown & black cinders trace sandy clay	GC	BKG	NDA
12				TOTAL DEPTH 10FT			

NOTES:

REMCOR

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 90249	PROJECT NAME: ALCOA	DATE: 8/20/90
BORING NUMBER: SB-8	DRILLING METHOD: HOLLOW STEM AUGER	DATE STARTED: 8/15/90
PAGE 1 OF 1	ENGINEER/GEOLOGIST: JAS	DATE COMPLETED: 8/15/90

Depth	Sample Type/No.	Blow Count	Recovery	Description	USCS Symbol	HMu Results (ppm)	Beta/Gamma Results (CCPM)
				1ft. concrete			
2	02	4/3/3/2	80%	Sandy loam & cinders	SM	BKG	NDA
4	24	2/3/2/2	40%	black cinders & brick fragments w/ trace clay	GC	BKG	NDA
6	46	3/3/3/3	40%	black cinders & brick fragments w/ trace clay	GC	BKG	NDA
8	68	3/2/2/6	40%	Brown medium sand trace silt & clay	SM	BKG	NDA
10	810	17/9 5/5	70%	Brown coarse sand trace clay & silt - saturated	SM	BKG	NDA
12				TOTAL DEPTH 10FT.			

NOTES:

REMCOR

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 90249	PROJECT NAME: ALCOA	DATE: 8/20/90
BORING NUMBER: SB-9	DRILLING METHOD: HOLLOW STEM AUGER	DATE STARTED: 8/15/90
PAGE 1 OF 1	ENGINEER/GEOLOGIST: JAS	DATE COMPLETED: 8/15/90

Depth	Sample Type/No.	Blow Count	Recovery	Description	USCE Symbol	HNu Results (ppm)	Beta/Gamma Results (CCPM)
2	02	3/5 34/17	50%	6" Black loam 6" black cinders & trace gravel	SM GC	BKG	NDA
4	24	6/4 6/13	80%	Brown silty clay - slightly mottled	CH	BKG	NDA
6	46	4/8 9/13	80%	Brown silty clay - slightly mottled	CH	BKG	NDA
8	68	14/12 16/14	80%	Brown silty clay - slightly mottled	CH	BKG	NDA
10	810	8/9 10/10	100%	Brown silty clay - moist	CH	BKG	NDA
12	TOTAL DEPTH 10FT.						

NOTES:

REMCOR

VISUAL CLASSIFICATION OF SOILS

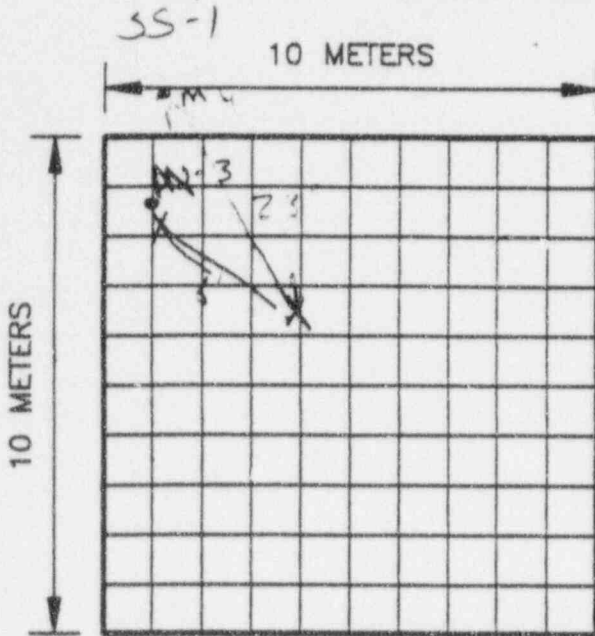
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BORING NUMBER: SE-3	DRILLING METHOD: HOLLOW STEM AUGER	DATE STARTED: 8/14/90
PAGE 1 OF 1	ENGINEER/GEOLOGIST: JAS	DATE COMPLETED: 8/14/90

Depth	Sample Type/No.	Blow Count	Recovery	Description	USCS Symbol	HMu Results (ppm)	Baru/Gamma Results (CCPM)
02		3/4 3/6	50%	Black loam- brick fragments	SM GC	BKG	DA
24		4/5 7/6	10%	Black slag green silty mat'l yellow brick in drive shoe sugar to 4ft.	GC	BKG	NDA
46		2/2 1/4	10%	2" piece of slag in drive shoe aqua colored fine sand silty material moist	GC	BKG	NDA
68		2/2 2/3	20%	Silty clay trace of gray mottle	SM	BKG	NDA
810		5/3 5/6	40%	Brown silty, sandy clay moist.	CL	BKG	NDA
				TOTAL DEPTH 10FT.			

NOTES:

ALCOA
CLEVELAND, OHIO

GRID SAMPLING/SURVEY RECORD



SAMPLE LOCATION

SAMPLE NO: RAL-SS-1-
DESCRIPTION: Gray material
DEPTH: Surface
SCAN RESULTS: NDA
SAMPLER: _____
DATE/TIME: 8/15/90 / 1000

SAMPLE NO: _____
DESCRIPTION: _____
DEPTH: _____
SCAN RESULTS: _____
SAMPLER: _____
DATE/TIME: _____

SAMPLE NO: _____
DESCRIPTION: _____
DEPTH: _____
SCAN RESULTS: _____
SAMPLER: _____
DATE/TIME: _____

SAMPLE NO: _____
DESCRIPTION: _____
DEPTH: _____
SCAN RESULTS: _____
SAMPLER: _____
DATE/TIME: _____

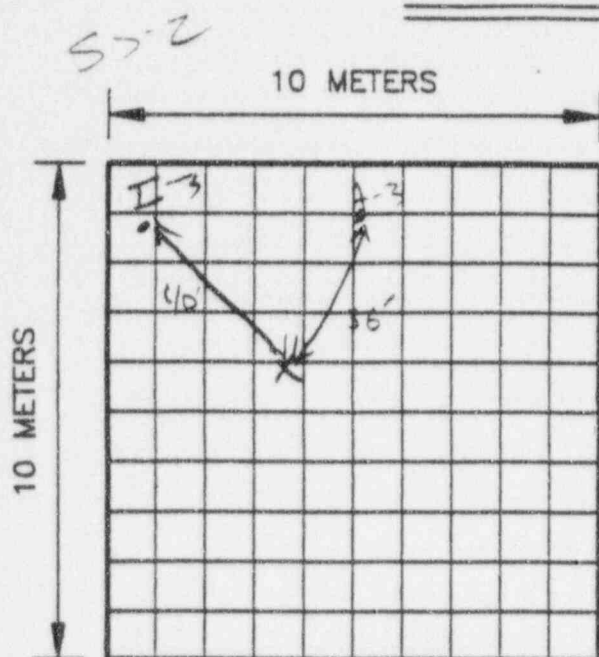
SAMPLE NO: _____
DESCRIPTION: _____
DEPTH: _____
SCAN RESULTS: _____
SAMPLER: _____
DATE/TIME: _____

SAMPLE NO: _____
DESCRIPTION: _____
DEPTH: _____
SCAN RESULTS: _____
SAMPLER: _____
DATE/TIME: _____

COMMENTS: _____

ALCOA
CLEVELAND, OHIO

GRID SAMPLING/SURVEY RECORD



SAMPLE LOCATION

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

SAMPLE NO: SS-3

DESCRIPTION: Black loam

DEPTH: Surface

SCAN RESULTS: NDA

SAMPLER: MG

DATE/TIME: 8/15/60 1030

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

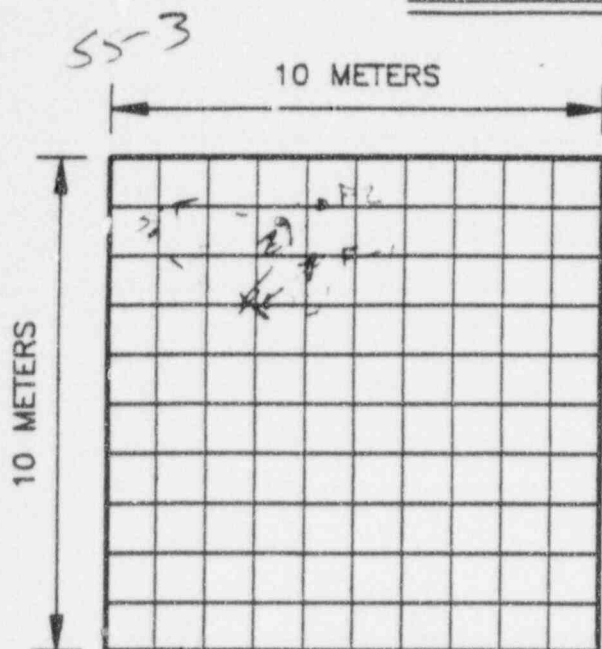
DATE/TIME: _____

COMMENTS: _____

ALCOA
CLEVELAND, OHIO

89034-A1

GRID SAMPLING/SURVEY RECORD



SAMPLE LOCATION

SAMPLE NO: _____
DESCRIPTION: _____
DEPTH: _____
SCAN RESULTS: _____
SAMPLER: _____
DATE/TIME: _____

SAMPLE NO: _____
DESCRIPTION: _____
DEPTH: _____
SCAN RESULTS: _____
SAMPLER: _____
DATE/TIME: _____

SAMPLE NO: 55-3
DESCRIPTION: brown sand
DEPTH: 5 ft
SCAN RESULTS: 10A
SAMPLER: MG
DATE/TIME: 8/5/90 1035

SAMPLE NO: _____
DESCRIPTION: _____
DEPTH: _____
SCAN RESULTS: _____
SAMPLER: _____
DATE/TIME: _____

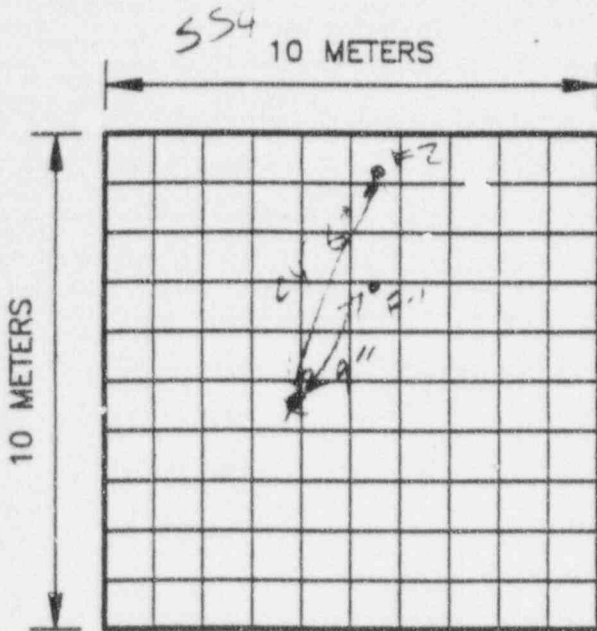
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DESCRIPTION: _____
DEPTH: _____
SCAN RESULTS: _____
SAMPLER: _____
DATE/TIME: _____

SAMPLE NO: _____
DESCRIPTION: _____
DEPTH: _____
SCAN RESULTS: _____
SAMPLER: _____
DATE/TIME: _____

COMMENTS: _____

ALCOA
CLEVELAND, OHIO

GRID SAMPLING/SURVEY RECORD



SAMPLE LOCATION

SAMPLE NO: SS-4
 DESCRIPTION: dark lean cinders
 DEPTH: Surface
 SCAN RESULTS: 200 LCPN
 SAMPLER: MAC
 DATE/TIME: 6/15/90 1045

SAMPLE NO: _____
 DESCRIPTION: _____
 DEPTH: _____
 SCAN RESULTS: _____
 SAMPLER: _____
 DATE/TIME: _____

SAMPLE NO: _____
 DESCRIPTION: _____
 DEPTH: _____
 SCAN RESULTS: _____
 SAMPLER: _____
 DATE/TIME: _____

SAMPLE NO: _____
 DESCRIPTION: _____
 DEPTH: _____
 SCAN RESULTS: _____
 SAMPLER: _____
 DATE/TIME: _____

SAMPLE NO: _____
 DESCRIPTION: _____
 DEPTH: _____
 SCAN RESULTS: _____
 SAMPLER: _____
 DATE/TIME: _____

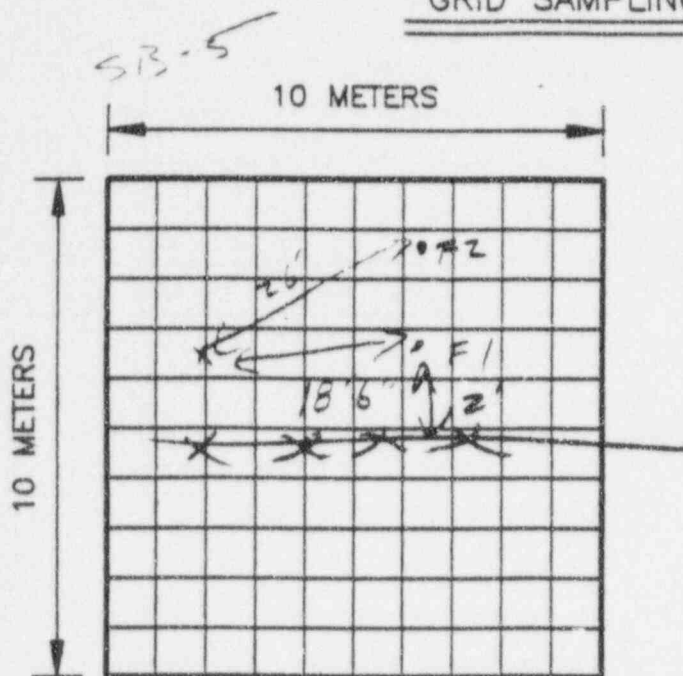
SAMPLE NO: _____
 DESCRIPTION: _____
 DEPTH: _____
 SCAN RESULTS: _____
 SAMPLER: _____
 DATE/TIME: _____

COMMENTS: _____

ALCOA
CLEVELAND, OHIO

89034-A1

GRID SAMPLING/SURVEY RECORD



SAMPLE LOCATION

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

SAMPLE NO: 55-5

DESCRIPTION: Black loam

DEPTH: Surface

SCAN RESULTS: NOA

SAMPLER: AC

DATE/TIME: 8/15/90 10:50

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

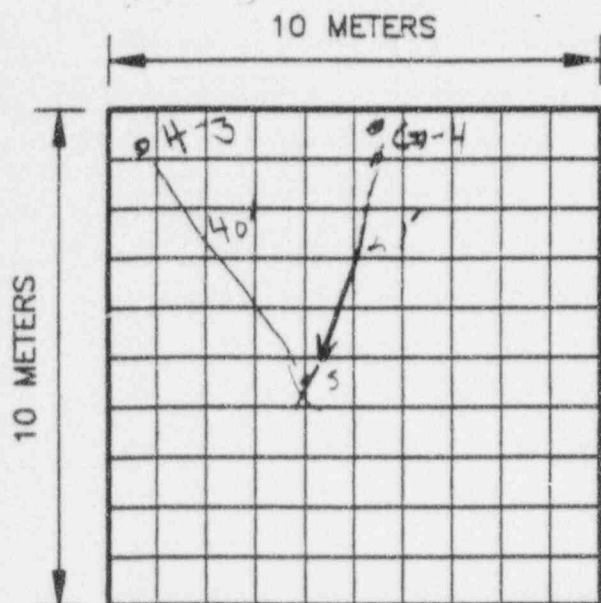
SAMPLER: _____

DATE/TIME: _____

COMMENTS: _____

ALCOA
CLEVELAND, OHIO

GRID SAMPLING/SURVEY RECORD



SAMPLE LOCATION

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

SAMPLE NO: SSG

DESCRIPTION: Black loam

DEPTH: surface

SCAN RESULTS: ADA

SAMPLER: MG

DATE/TIME: 8/15/90 / 11:00

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

SAMPLE NO: _____

DESCRIPTION: _____

DEPTH: _____

SCAN RESULTS: _____

SAMPLER: _____

DATE/TIME: _____

COMMENTS: _____

APPENDIX E
ANALYTICAL DATA AND CHAIN-OF-CUSTODY FORMS



ENGINEERING & MANAGEMENT SERVICES
2105 LUNA ROAD, SUITE 390
CARROLLTON, TEXAS 75006
214/247-1714
214/247-0268 FAX

REPORT OF ANALYSIS

ANL JOB# 90-0779

08/31/90

REMCOR 10267

25 SOIL SAMPLES, DATE RECEIVED 08/16/90

SAMPLE I. D.	ANALYSIS	CONCENTRATION	ERROR EST.	UNITS	LLD	UNITS
RAL-SB1-02	U-238	2.54 E + 1	8.51 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12493	TH-232	6.55 E + 0	6.13 E - 1	pCi/g	9 E - 8	uCi/g
RAL-SB1-24	U-238	3.95 E - 1	1.23 E + 0	pCi/g	9 E - 7	uCi/g
A.N.L. 12494	TH-232	1.04 E + 0	2.24 E - 1	pCi/g	8 E - 8	uCi/g
RAL-SB2-02	U-238	6.49 E + 0	1.88 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12495	TH-232	4.52 E - 1	8.35 E - 2	pCi/g	1 E - 7	uCi/g
RAL-SB2-24	U-238	4.13 E + 0	2.48 E + 0	pCi/g	9 E - 7	uCi/g
A.N.L. 12496	TH-232	5.44 E - 1	1.30 E - 1	pCi/g	8 E - 8	uCi/g
RAL-SB3-02	U-238	1.37 E + 1	5.18 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12497	TH-232	1.21 E + 0	2.23 E - 1	pCi/g	1 E - 7	uCi/g
RAL-SB3-24	U-238	4.25 E - 1	1.35 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12498	TH-232	4.71 E - 1	1.63 E - 1	pCi/g	9 E - 8	uCi/g
RAL-SB4-02	U-238	4.49 E - 1	1.39 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12499	TH-232	2.57 E - 1	1.28 E - 1	pCi/g	9 E - 8	uCi/g
RAL-SB4-24	U-238	3.95 E + 0	1.01 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12500	TH-232	5.66 E - 1	6.83 E - 2	pCi/g	1 E - 7	uCi/g
RAL-SB5-02	U-238	5.84 E + 0	3.02 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12501	TH-232	7.97 E - 1	1.61 E - 1	pCi/g	1 E - 7	uCi/g
RAL-SB5-24	U-238	4.11 E - 1	1.24 E + 0	pCi/g	9 E - 7	uCi/g
A.N.L. 12502	TH-232	9.33 E - 4	4.67 E - 2	pCi/g	8 E - 8	uCi/g
RAL-SB6-05	U-238	6.44 E - 1	1.95 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12503	TH-232	4.71 E + 0	5.92 E - 1	pCi/g	1 E - 7	uCi/g

THESE ANALYSES WERE PERFORMED USING
NBS TRACEABLE PROCEDURES AND STANDARDS.



ENGINEERING & MANAGEMENT SERVICES
2105 LUNA ROAD, SUITE 390
CARROLLTON, TEXAS 75006
214/247-1714
214/247-0268 FAX

REPORT OF ANALYSIS

ANL JOB# 90-0779

08/31/90

REMCOR 10267

25 SOIL SAMPLES, DATE RECEIVED 08/16/90

SAMPLE I. D.	ANALYSIS	CONCENTRATION	ERROR EST.	UNITS	LLD	UNITS
RAL-SB6-52	U-238	4.69 E - 1	1.46 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12504	TH-232	1.13 E - 1	9.65 E - 2	pCi/g	1 E - 7	uCi/g
RAL-SB6-24	U-238	3.50 E - 1	1.15 E + 0	pCi/g	9 E - 7	uCi/g
A.N.L. 12505	TH-232	6.65 E - 1	1.75 E - 1	pCi/g	8 E - 8	uCi/g
RAL-SB7-02	U-238	1.92 E - 1	9.42 E - 1	pCi/g	1 E - 6	uCi/g
A.N.L. 12506	TH-232	5.01 E - 1	1.37 E - 1	pCi/g	9 E - 8	uCi/g
RAL-SB7-24	U-238	4.97 E - 1	1.52 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12507	TH-232	7.44 E - 2	8.69 E - 2	pCi/g	1 E - 7	uCi/g
RAL-SB8-02	U-238	5.03 E - 1	1.51 E + 0	pCi/g	1 E - 6	uCi/g
LISTED AS:	TH-232	8.99 E - 2	9.10 E - 2	pCi/g	9 E - 8	uCi/g
RAL-SB08-1'-3'						
A.N.L. 12508						
RAL-SB8-24	U-238	4.11 E - 1	1.30 E + 0	pCi/g	1 E - 6	uCi/g
LISTED AS:	TH-232	5.44 E - 1	1.71 E - 1	pCi/g	9 E - 8	uCi/g
RAL-SB08-3'-5'						
A.N.L. 12509						
RAL-SB9-02	U-238	4.19 E + 0	2.27 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12510	TH-232	7.12 E - 1	1.34 E - 1	pCi/g	9 E - 8	uCi/g
RAL-SB2-24	U-238	2.55 E + 0	2.75 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12511	TH-232	8.56 E - 1	2.21 E - 1	pCi/g	9 E - 8	uCi/g
RAL-SS1	U-238	1.25 E + 1	6.98 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12512	TH-232	9.54 E - 1	2.80 E - 1	pCi/g	1 E - 7	uCi/g
RAL-SS2	U-238	1.81 E + 1	8.07 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12513	TH-232	1.73 E + 0	3.58 E - 1	pCi/g	1 E - 7	uCi/g

THESE ANALYSES WERE PERFORMED USING
NBS TRACEABLE PROCEDURES AND STANDARDS.



ENGINEERING & MANAGEMENT SERVICES
2105 LUNA ROAD, SUITE 390
CARROLLTON, TEXAS 75006
214/247-1714
214/247-0268 FAX

REPORT OF ANALYSIS

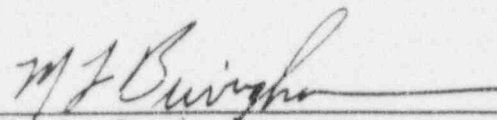
ANL JOB# 90-0779

08/31/90

REMCOR 10267

25 SOIL SAMPLES, DATE RECEIVED 08/16/90

SAMPLE I. D.	ANALYSIS	CONCENTRATION	ERROR EST.	UNITS	LLD	UNITS
RAL-SS3	U-238	5.08 E - 1	1.53 E + 0	pCi/g	1 E - 6	uCi/g
A.N.L. 12514	TH-232	1.16 E - 3	5.78 E - 2	pCi/g	1 E - 7	uCi/g
RAL-SS4	U-238	4.11 E + 1	1.27 E + 1	pCi/g	2 E - 6	uCi/g
A.N.L. 12515	TH-232	4.63 E + 1	1.91 E + 0	pCi/g	1 E - 7	uCi/g
RAL-SS5	U-238	6.43 E - 1	2.10 E + 0	pCi/g	2 E - 6	uCi/g
A.N.L. 12516	TH-232	1.99 E - 1	1.51 E - 1	pCi/g	1 E - 7	uCi/g
RAL-SS6	U-238	4.20 E + 1	1.24 E + 1	pCi/g	2 E - 6	uCi/g
A.N.L. 12517	TH-232	5.18 E - 2	1.02 E - 1	pCi/g	1 E - 7	uCi/g


M. L. Buvinghausen
Manager, Radiochemistry Laboratories

THESE ANALYSES WERE PERFORMED USING
NBS TRACEABLE PROCEDURES AND STANDARDS.



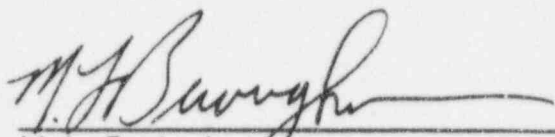
ENGINEERING & MANAGEMENT SERVICES
2105 LUNA ROAD, SUITE 390
CARROLLTON, TEXAS 75006
214/247-1714
214/247-0268 FAX

REPORT OF ANALYSIS
ANL JOB# 90-0779
09/19/90

REMCOR 10267

5 SOIL SAMPLES (RERUNS)

SAMPLE I.D.	ANALYSIS	CONCENTRATION	ERROR EST.	UNITS	LLD	UNITS
RAL-SB-24	U-238	1.18 E -1	+ 1.74 E 0	pCi/g	2 E -6	uCi/g
A.N.L. 12494	TH-232	1.08 E 0	+ 1.54 E -1	pCi/g	8 E -8	uCi/g
RAL-SB3-24	U-238	0.00 E 0	+ 1.36 E 0	pCi/g	2 E -6	uCi/g
A.N.L. 12498	TH-232	7.69 E -1	+ 1.57 E -1	pCi/g	9 E -8	uCi/g
RAL-SB6-24	U-238	0.00 E 0	+ 1.35 E 0	pCi/g	2 E -6	uCi/g
A.N.L. 12505	TH-232	5.42 E -1	+ 1.35 E -1	pCi/g	8 E -8	uCi/g
RAL-SS4	U-238	2.32 E 1	+ 9.68 E 0	pCi/g	3 E -6	uCi/g
A.N.L. 12515	TH-232	3.74 E 1	+ 3.74 E 1	pCi/g	1 E -7	uCi/g
RAL-SS5	U-238	0.00 E 0	+ 2.20 E 0	pCi/g	3 E -6	uCi/g
A.N.L. 12516	TH-232	7.34 E -1	+ 2.02 E -1	pCi/g	1 E -7	uCi/g


M. L. Buvinghausen
Manager, Radiochemistry Laboratory



REQUEST FOR ANALYSIS

R/A CONTROL NO. _____

C/C CONTROL NO. _____

PROJECT NAME

Remcor

PROJECT NUMBER

90249

PROJECT MANAGER

Earl Koffloss

BILL TO

Remcor

DATE SAMPLES SHIPPED

8/15/80

LAB DESTINATION

Alpla Energy

LABORATORY CONTACT

Mike B. Binglese

SEND LAB REPORT TO

Earl Koffloss

DATE REPORT REQUIRED _____

PROJECT CONTACT _____

PURCHASE ORDER NO. _____

PROJECT CONTACT PHONE NO. _____

SAMPLE NO.	SAMPLE TYPE	SAMPLE VOLUME	PRESERVATIVE	REQUESTED TESTING PROGRAM	SPECIAL INSTRUCTIONS
<u>1711 Samples</u> <u>cut 8/15/80</u>				<u>Gamma spec. Thorium</u> <u>232 - Uranium 234.</u>	

TURNAROUND TIME REQUIRED

NORMAL: ☒

RUSH: _____

POSSIBLE HAZARD IDENTIFICATION:

NONHAZARD: ☒

FLAMMABLE: _____

SKIN IRRITANT: _____

HIGHLY TOXIC: _____

OTHER: _____

(PLEASE SPECIFY)

SAMPLE DISPOSAL:

RETURN TO CLIENT: _____

DISPOSAL BY LAB: ☒

FOR LAB USE ONLY

RECEIVED BY: _____

DATE/TIME: _____

WHITE - ORIGINAL, TO ACCOMPANY SAMPLES
 YELLOW - FIELD COPY

REMCOR

CHAIN OF CUSTODY RECORD

1624

PROJECT NO.: 90249		PROJECT NAME: Remcor			NO. OF CON- TAINERS	REMARKS													
SAMPLERS: Joe Serrata																			
SAMPLE	DATE	TIME	SAMPLE MEDIUM	SAMPLE LOCATION															
RALSBB 24	8/14/90		Soil		1														
RALSBB 02	8/15/90				1														
RALSBB 24					1														
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RALSBB 02																			

REMCOR

CHAIN OF CUSTODY RECORD

N2 1481

PROJECT NO.: 8802349		PROJECT NAME: HRENCOR			NO. OF CON- TAINERS	REMARKS											
SAMPLERS: Joe Seibel, Sen. to																	
SAMPLE	DATE	TIME	SAMPLE MEDIUM	SAMPLE LOCATION													
RAL-SB1 OZ	8/14/90		Soil		1												Call Joe Seibel to @
RAL-SB1 24					1												Remcor upon
RAL-SB2 OZ					1												Receipt 412 967
RAL-SB2 24					1												
RAL-SB3 OZ					1												
RAL-SB3 24					1												
RAL-SB4 OZ					1												
RAL-SB4 24					1												
RAL-SB5 OZ					1												
RAL-SB5 24					1												
RAL-SB6 0.5					1												
RAL-SB6 -57					1												

RELINQUISHED BY:	DATE/TIME	RECEIVED BY:	RELINQUISHED BY:	DATE/TIME	RECEIVED BY:
RELINQUISHED BY:	DATE/TIME	RECEIVED BY:	RELINQUISHED BY:	DATE/TIME	RECEIVED BY:
RELINQUISHED BY:	DATE/TIME	RECEIVED FOR LAB BY:	DATE/TIME	POSSIBLE HAZARD:	



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