

WORK PLAN
NATURALLY OCCURRING
RADIOACTIVE MATERIAL
AREA REMEDIATION
PERMANENT MOLD DIVISION AREA

CLEVELAND WORKS
THE ALUMINUM COMPANY OF AMERICA

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PREPARED FOR

THE ALUMINUM COMPANY OF AMERICA
CLEVELAND, OHIO

JUNE 14, 1991

PROJECT NO. 91062.1

REMCOR, INC.
PITTSBURGH, PENNSYLVANIA

PREPARED BY _____ DATE _____

REVIEW/APPROVAL BY:	SIGNATURE	DATE
PROJECT DIRECTOR	_____	_____
HEALTH AND SAFETY	_____	_____
RADIATION SAFETY	_____	_____
QUALITY ASSURANCE	_____	_____
ALCOA	_____	_____

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1.0 INTRODUCTION

Remcor, Inc. (Remcor) has been retained by The Aluminum Company of America (Alcoa) to prepare a scope of work for the remediation of materials containing low concentrations of thorium at the Cleveland Works, Cleveland, Ohio (Figure 1). The presence of thorium-containing materials on the Alcoa property was identified during an assessment of an adjacent site and has been confirmed by three subsequent studies of portions of the Alcoa site. This work plan is based on the findings of these previous studies and presents specifications and methods for the various tasks necessary to remediate the area of reported thorium-containing materials to meet the site release criteria of the Nuclear Regulatory Commission (NRC).

This work plan and the related procedural documents will be distributed as follows:

- NRC, Region III:
 - Project Manager
 - Verification Service Contractor
- Alcoa:
 - Project Manager
 - Health and Safety Officer (HSO)
 - Contracts Administrator
- Contractor:
 - Project Manager
 - HSO
 - Radiation Safety Officer
 - Quality Control Officer

- Site Superintendent
- Site Health and Safety Supervisor
- Site Health Physics Supervisor.

These distributions will be made after work plan approvals by NRC and Alcoa and after Contractor selection.

1.1 SUMMARY OF WORK

The thorium-containing materials are to be excavated to an appropriate lateral and vertical extent based on the results of a field screening program. The excavated materials will be managed on site pending off-site laboratory analysis of sampled materials. Materials for which these analyses confirm the presence of thorium above the NRC criteria for unrestricted release will be disposed of off site. It is currently anticipated that off-site disposal will be at a naturally occurring radioactive materials (NORM) disposal facility. Specifications for waste removal, handling, storage, packaging, transport and disposal, and verification of completion of removal are presented in the following chapters.

The work will be performed in conformance with regulations promulgated by the NRC, which has regulatory authority over management and handling of radioactive materials, and as specified in Title 10 of the Code of Federal Regulations (10 CFR). NRC regulations related to worker and environmental protection (10 CFR 19

and 10 CFR 20) are applicable to all activities involving radioactive materials. This site is not currently subject to an NRC radioactive materials license. Therefore, NRC regulations relating to license termination (10 CFR 40) are not directly applicable. These regulations do provide useful guidance relating to verification procedures and release documentation and have been used as a basis for the radiological control, testing, and verification procedures described in this plan.

1.2 SITE DESCRIPTION

The Cleveland Works is an aluminum forging facility located on Harvard Avenue in the villages of Newburgh Heights and Cuyahoga Heights, suburbs of Cleveland, Ohio. The area of interest lies within the Permanent Mold Division area, an idle portion of the facility (Figure 1).

Owners of the properties immediately adjacent to the area of interest include:

- To the East - McGean-Rohco Chemical Company, formerly owned by Chemetron Investments, Inc. (Chemetron), a subsidiary of Sunbeam-Oster, Inc.
- To the South - An out-of-service rail line owned by Newburgh and South Shore Railroad Company (N&SS).

Alcoa has indicated that the area of interest was a portion of the site used by the American Magnesium Company (AMC), a wholly owned subsidiary of Alcoa, prior to AMC's being dissolved in 1954. AMC reportedly 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 thorium-containing materials as hardening agents. The use of thorium is reported to have been initiated in approximately 1900 and to have been discontinued before or during 1954. No information is available describing the quantities or forms of thorium used by AMC at the site. Alcoa has indicated that neither Alcoa nor its subsidiaries at the site have been involved with the use of thorium or other radioactive materials since 1954.

The work area measures approximately 20 by 100 feet (Figure 2). This area is along a fence line at the south boundary of the Alcoa property near the southeast property corner. The work area extends southward onto the N&SS property.

The work site is an open yard area south of the now-idle manufacturing buildings of the Alcoa Permanent Mold Division. The work site is surfaced with a combination of ordinary dirt, slag, and cinders. The northern edge of the work site is a concrete slab. The work area is bisected by a chain-link fence supported on steel poles with concrete foundations. Overhead power lines traverse the work area. These lines are inactive and will be

removed before remediation is initiated. There are no known underground structures, tanks, or utilities in the work site, and there are no structures or utility poles within the currently identified excavation limits.

1.3 SURVEY DATA

Several studies evaluating the presence of radioactive materials have been performed at this site. The initial evaluation of the site was performed as part of an assessment of an adjacent property. Subsequent to this initial study, which indicated some thorium-containing materials on the Alcoa site, three additional site studies have been completed.

1.3.1 Oak Ridge Associated Universities - 1985

An initial site assessment was performed by the Oak Ridge Associated Universities (ORAU) in 1985 for the NRC. This study was conducted as part of a confirmatory radiological assessment of the adjacent Chemetron property. Five shallow soil borings were completed on the Alcoa and N&SS properties during this study. A total of 10 soil samples (to a maximum depth of 1.5 feet below surface) were collected from these borings and submitted for laboratory analyses of uranium 238 (U-238) and thorium 232 (Th-232) by gamma spectroscopy.

The results of the study, documented in ORAU's "Confirmatory Radiological Survey of the Harvard Avenue Property, Chemetron Corporation, Newburgh Heights, Ohio," September 1988, indicated Th-232 levels of 15.5 to 620 picoCuries per gram (pCi/g) with the high Th-232 activities reported for the surface soil samples. These samples were also reported to contain U-238 in concentrations exceeding background levels for this area and ranging from 5 to 550 pCi/g.

1.3.2 NUS, Inc. - 1989

NUS, Inc. (NUS) conducted a radiation intensity survey of the site surface in 1989. The results of this study, which measured total energy using a Ludlum Model 19-Micro R Survey Meter, are summarized in an NUS report "Radiation Survey of the Harvard Avenue Property for Aluminum Company of America," August 1989. Several areas of elevated radiation were identified. Three of these areas are located along the south fence line, and the most prominent zone of elevated activity encompassed an area of approximately 70 by 20 feet (Figure 2).

1.3.3 Pemcor, Inc. - Spring 1990

Remcor performed an investigation in early 1990 to determine if U-238 had migrated onto the Alcoa and N&SS properties from Chemetron. As part of the study, a total of 58 soil samples were

collected from 20 shallow borings on the Alcoa property and 38 shallow borings on the N&SS site. The Alcoa borings were spaced along the 490-foot common boundary between the Alcoa and Chemetron sites and within 13 feet of the boundary.

Collected samples were field screened for elevated radiation using a beta-gamma radiation survey instrument. Five of these samples, 2 from Alcoa and 3 from N&SS, were submitted to an off-site laboratory for thorium analysis. Four of these samples were found to contain less than 10 pCi/g of thorium; the fifth, from the N&SS property, was reported to contain 1,127 pCi/g of Th-232.

In addition, 29 soil samples were selected, on the basis of the field instruments screening results, for qualitative analysis for U-238 radioactivity in a field laboratory. Of these 29 samples, 20 were from the Alcoa property along the Alcoa-Chemetron boundary north of the N&SS right-of-way. These qualitative field laboratory analysis results did not indicate the presence of U-238 at levels exceeding NRC criteria (25 pCi/g) for unrestricted release in any of these 20 samples.

The remaining 9 of the 29 samples selected for field laboratory analysis were from the N&SS right-of-way south of the Alcoa property. The field laboratory results indicated the presence of U-238 at levels above NRC release criteria in 4 samples. The collection locations for these 4 samples were within 50 feet to

the west of the southwest corner of the former Chemetron property. The reported U-238 levels for these 4 samples ranged from 69 pCi/g to 292 pCi/g. The highest level was reported for the sample taken nearest the former Chemetron property, and the reported levels in the other 3 of these samples decreased as the distance from the Chemetron property to the sample location increased. Five samples were taken from locations more than 50 feet west of the southwest corner of the former Chemetron property. Qualitative field analysis results for these 5 samples did not indicate the presence of U-238 at levels in excess of NRC unrestricted release criteria. The soil materials identified from this testing program as containing U-238 at levels above NRC release criteria were removed from the N&SS property by Remcor, under contract to Chemetron, in 1990.

The study findings were presented in letter reports from Remcor to Alcoa dated June 11 and 20, 1990.

1.3.4 Remcor, Inc. - Summer 1990

The most recent study was implemented by Remcor during August 1990. The study included the completion of nine soil borings and collection of subsurface samples, a limited walkover survey, and collection of six surface soil samples. The sample locations are

identified in Figure 2. The field methodologies and study results are presented in "Final Report Preliminary Radiological Assessment of the Permanent Mold Division Area, Cleveland, Ohio Works, The Aluminum Company of America," Remcor, November 1990.

The soil borings were located in various portions of the area of concern to evaluate the lateral and vertical extent of radiological impact, provide background data, and evaluate conditions near the rail line. The results of this study, combined with the data from the earlier studies, has been used to make an initial determination of the area to be remediated under this work plan. The resulting estimated area of thorium contamination is shown in Figure 3.

1.4 REGULATORY GUIDANCE

Remcor has used the following regulatory documents, where applicable, for guidance in the development of appropriate remediation procedures, health and safety measures, and release verification methods:

- NRC Regulations, 10 CFR Parts 19, 20, and 40
- NRC Branch Technical Position Paper, October 23, 1981, "Disposal or Onstorage of Thorium or Uranium Wastes from Past Operations," Federal Register (BTPP)
- U.S. Department of Transportation (DOT) Regulations, 49 CFR Part 173.425
- NUREG CR-2082, "Monitoring for Compliance with Decommissioning Termination Survey Criteria" (NUREG CR-2082)

- NRC, August 1987, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Sources, or Special Nuclear Material" (NRC, August 1987).

1.5 OTHER REFERENCES

All on-site activities for the proposed remediation will be completed in accordance with the site- and work-specific health and safety plan (HASP), dated June 14, 1991. This HASP addresses construction safety and health issues and conforms to the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). Health physics and NRC requirements for worker, public, and environmental protection are addressed in the Radiation Controls Plan (RCP) dated June 18, 1991. The HASP and the RCP are published separately and incorporated into this work plan by reference. Additional task-specific health physics and radiation monitoring procedures are described in the appropriate sections of this work plan.

In an effort to maintain consistency throughout implementation of this scope of work, selected standard operating procedures (SOPs) for various field sampling, remediation, and related tasks will be followed in conducting this work. The applicable SOPs will be published separately and are incorporated into this work plan by reference. In the event of conflict between the provisions of this work plan and the SOPs, the requirements of this work plan will prevail.

1.6 SITE ACCESS

The area of interest will be accessed through the Alcoa property. Permission for access to the N&SS property will be obtained by the Contractor prior to project start-up. Access to this property is necessary for maneuvering equipment and personnel and to remediate the thorium-containing materials reported to be on N&SS property. The fence between the N&SS and Alcoa properties will be removed from the immediate work area by the Contractor prior to initiation of on-site activities and replaced following verification surveys and excavation backfilling.

1.7 COORDINATION WITH THE ALUMINUM COMPANY OF AMERICA

To expedite completion of this project, working hours will commence at approximately 7:00 a.m. and cease at approximately 6:00 p.m. for the duration of the work in the field. Alcoa plant security will be informed of the activities and will allow access for the Contractor and all subcontractors during these hours. The Contractor will coordinate access to the Alcoa truck scales and to other facilities needed for this project with appropriate Alcoa personnel. The anticipated date and time of delivery of supplies and equipment, during mobilization and the investigation, will be relayed to the proper Alcoa personnel as the information becomes available to the Contractor. The Contractor's Site Superintendent will be responsible for all field coordination with the client and subcontractors.

Plant utility lines and access points to water and electric power will be identified by the plant engineering department during regular working hours prior to the start of field activities.

1.8 WORK PLAN ORGANIZATION

The remainder of this document is divided into eight chapters. Chapters 2.0 through 8.0 each focus on a key task necessary for the successful implementation and completion of this project. Chapter 9.0 addresses project schedule. The issues addressed in each chapter are summarized below. Detailed descriptions of the tasks are presented in the appropriate chapters which follow:

- Chapter 2.0, Mobilization - This chapter addresses the work to be performed prior to initiation of the remediation, including:
 - Approval of this work plan and support documents and notification of work to appropriate agencies
 - Arrangements for laboratory analysis
 - Arrangements for materials disposal
 - Arrangements for material transportation
 - Mobilization of necessary equipment and supplies
 - Medical training and monitoring
 - Site setup
 - Mobilization of safety supplies and equipment
 - General site preparation.
- Chapter 3.0, Excavation and Related Work - This chapter addresses the methods of and criteria for excavation of thorium-containing soils, cleaning of exposed concrete, and on-site staging and testing of excavated materials.

- Chapter 4.0, Shipment Preparation - Procedures for material loading, manifest preparation, surveying of shipment for radiological activity, and truck weighing and release are addressed in this chapter. In addition, documentation of exclusive use, transportation route, reporting, and emergency protocols are discussed.
- Chapter 5.0, Transportation and Disposal - The route of materials transport and protocol for verification of disposal are addressed.
- Chapter 6.0, Verification Surveys - The location of in-situ surveying, soil sample collection, and concrete swipes is discussed in this chapter. In addition, the documentation of field activities, coordination with the NRC, and quality control issues are presented.
- Chapter 7.0, Demobilization - Procedures for equipment decontamination, removal of access controls, and back-filling of the excavation are discussed. Monitoring of worker conditions is also addressed.
- Chapter 8.0, Final Report - The information to be presented and discussed in the final report to the NRC and other appropriate agencies are identified. The request for unrestricted release of the work area by the NRC is to be contained within this report.
- Chapter 9.0, Project Schedule - The anticipated schedule for implementation and completion of all project tasks through final report and release of liability is presented in this chapter.

2.0 MOBILIZATION

Mobilization activities include the management issues which must be addressed and the work items which must be completed prior to the start of excavation to ensure an efficient and successful project. The management issues to be resolved include work approvals, project notifications to regulatory agencies, N&SS access arrangements, procurement of laboratory services, finalization of disposal arrangements, and establishment of transportation arrangements. The work items include receipt of equipment and supplies, worker training and medical testing, site setup, initiation of site air monitoring, and site preparation. The approaches to these issues and work items are described in this chapter.

2.1 APPROVALS AND NOTIFICATIONS

This work plan is to be approved by the NRC. The work plan will be submitted to the NRC after review and approval by Alcoa. The NRC will notify Alcoa of project approval, and Alcoa will issue notice-to-proceed with project implementation.

Subsequently, Alcoa and the Contractor will notify the Ohio Department of Health, Bureau of Radiological Health, the Cuyahoga County Board of Health, and the village authorities of the proposed remediation start date. Where appropriate, copies of the approved work plan and related documents will be provided to these agencies.

2.2 NEWBURGH AND SOUTH SHORE RAILROAD COMPANY ACCESS ARRANGEMENT

With approval from Alcoa, the Contractor will contact N&SS management officials to schedule access to the N&SS right-of-way south of the Alcoa Permanent Mold Division. This right-of-way is currently inactive. An access agreement has been negotiated between N&SS and Alcoa for the purpose of thorium remediation on the N&SS property.

2.3 LABORATORY ARRANGEMENTS

Upon Contractor receipt of authorization to proceed from Alcoa, the Contractor will prepare a purchase order to one or more approved laboratories for dosimetry, bioassay, soil sample, air sample, and other needed radiological analysis services. The laboratory will also provide appropriate shipping containers, labels, and other necessary supplies to the Contractor. Additions to the analytical program which are not addressed by the purchase order (based on field or other conditions) will be approved by the Alcoa Project Manager prior to issuance of a change order or amended purchase order by the Contractor to the analytical laboratory.

2.4 DISPOSAL ARRANGEMENTS

A disposal site will be identified and final acceptance of material will be arranged prior to initiation of material excavating. A purchase order for the selected disposal site will be issued prior to waste shipment. The currently preferred site for

disposal appears to be the Envirocare of Utah, Inc. (Envirocare) facility at Clive, Utah. The material from the Alcoa site has been declared to be acceptable for disposal by Envirocare on the condition that there is no current NRC license for source materials in effect at the Alcoa site and that the material meets Envirocare's physical, chemical, and radiological standards. Disposal at the Envirocare site will involve transportation and disposal in bulk.

2.5 TRANSPORTATION ARRANGEMENTS

After the disposal site has been formally approved, a trucking service subcontractor will be selected. Transportation will be in bulk by trailer dump truck to a NORM disposal site.

2.6 EQUIPMENT AND SUPPLIES

After Alcoa issues notice-to-proceed, the Contractor will mobilize the necessary equipment and supplies to the job site. The items to be delivered will include:

- Tractor-backhoe
- Hand tools
- Personal protective clothing and equipment
- Radiation survey instruments
- Cleaning supplies
- Placards and shipping document blank forms
- Air monitoring apparatus
- Polyethylene sheeting.

If deliveries are initiated before Contractor personnel arrive on site, Alcoa will accept and store the received items pending Contractor mobilization. Alcoa will provide storage space, office space, sanitary facilities, and access to a truck scale.

2.7 TRAINING AND MEDICAL MONITORING

Contractor and subcontractor personnel who will be actively involved with on-site remediation will be required to attend a one-day health and safety training program. The meeting, which will be conducted by the on-site Health and Safety Officer (HSO), will be held at the site and will address project-specific and radiological safety issues.

Contractor and subcontractor workers will supply documentation of completion of the OSHA 40-hour hazardous waste training program and participation in a medical monitoring program or appropriate NRC training and medical monitoring programs, to the Contractor's on-site HSO prior to their presence on site. A bioassay (urinalysis) test and data on prior radiation exposure in NRC Form 4 or equivalent form will be obtained from Contractor and subcontractor personnel before site work is initiated.

Each on-site worker will be issued a personal thermoluminescent detector dosimeter. Dosimeters will be collected and read as each worker leaves the site at the end of the project, and

results will be tabulated by an off-site laboratory. Results will be sent to the site and made available to the workers. Each worker's NRC Form 4 will be updated at the end of the project with the applicable dosimetry results.

2.8 SITE SETUP

The Contractor will establish control zones for radiological and support work activities prior to the on-site presence of the subcontractors and in accordance with standard industry procedures. These control zones will delineate the work boundaries and material staging areas. In addition, the excavation area will be clearly identified and defined through the use of perimeter barriers and appropriate warning signs and barrier tapes which will be in place during work activities, when possible, and during all nonworking hours. Various areas will be identified as off-limits to personnel not actively involved with the direction and/or implementation of the field activities.

2.9 AIR MONITORING

Continuous air monitoring will be performed at the perimeter of the work zone using a continuous air sampler with removable filters. This air monitoring will be initiated before excavation is started and will continue until the excavated material is removed from the site and the completion of remediation is verified. The filters will be removed at specified intervals and

sent to the off-site laboratory for gross alpha, Th-232, and U-238 analysis. Filter packaging, shipment, field documentation, and laboratory analysis will follow recognized industry and laboratory procedures.

The continuous samplers will be supplemented by hand-held radiation meters operated periodically at or near the point of excavation and/or material handling. This monitoring will be performed with an Eberline AMS-3, or equivalent, for beta-gamma measurements and an Eberline Alpha-5 for alpha measurements.

An air sample survey report will be completed daily for the continuous air monitoring equipment and for each radiation counter reading. Air monitoring protocols, survey reports, and calibration and maintenance of instruments are addressed in the SOPs.

2.10 SITE PREPARATION

After Alcoa confirms that the power lines over the work site are inactive or has arranged for their deactivation, the Contractor will arrange for the removal of these lines. Alcoa will identify and deactivate any underground utilities in or around the excavation area. Alcoa will remove any equipment or materials stored in the work area. Before initiating excavation, the Contractor will obtain a digging permit from the Alcoa safety department at the Cleveland Works.

The Contractor will remove the fence between the Alcoa and N&SS properties. The fence fabric and poles will be stored for future reinstallation. The concrete foundations for the fence poles will be cleaned or disposed as appropriate.

3.0 EXCAVATION AND RELATED WORK

3.1 RADIOLOGICALLY CONTROLLED AREA

The excavation area will be initially delineated by a surface radiation survey, and this area will be established as a radiologically controlled area (RCA) with appropriate boundary rope and postings. Access to and from the RCA will be controlled by qualified radiological technicians. Radiological control and contamination dispersion prevention will include the following types of activities:

- Transfer of equipment and personnel in and out of the RCA will be controlled to prevent potential contamination of adjacent areas external to the RCA. Equipment and tools will be cleaned and surveyed prior to removal from the RCA. Personnel protective clothing and devices, as well as preparation of tools and equipment prior to use in the RCA, will be employed as part of the overall health and safety program.
- Additional radiological controls and monitoring will be performed during removal operations based on the primary radiation exposure pathway of the contaminated materials, namely inhalation and ingestion. Respiratory protection for operations personnel and fugitive dust mitigation techniques are of particular importance. Continuous air sampling will be performed to ensure ambient air concentrations are well within unrestricted area air concentrations in accordance with 10 CFR 20.
- Two soil lay-down areas will be established outside the RCA for deposition of segregated soil from the excavation. Areas will be prepared with a ground surface cover and finally tarped and secured to preclude contact with other soil surfaces and prevent distribution of the soil material after excavation. The two areas will be radiologically controlled pending final sample analysis.

3.2 EXCAVATION METHODS

The area of interest will be excavated to the appropriate depth and horizontal limits, using a small tractor-backhoe (Bobcat™ or equivalent). In zones which are inaccessible to the backhoe, an assortment of hand tools will be used to remove the material. Hand tools also may be used to remove residual material "hot spots" from the floor and sides of the excavation during remediation verification. Both the backhoe and hand tools may be used to segregate materials containing thorium in excess of NRC release criteria from those soils meeting NRC release criteria following removal of the materials from the excavation.

The excavation increments will be limited to approximately 0.1 cubic yard. Each increment will be screened at the point and time of excavation using 2-inch by 2-inch sodium-iodide (NaI) gamma radiation scintillation detectors. Materials which are found, on the basis of these field instrument readings, to exhibit radioactivity at greater than two times background will be segregated from materials which do not exhibit radioactivity above this level and placed in two separate, secured areas. Excavation will continue until these field instruments indicate that the soils at the interior surfaces of the excavation do not exhibit radioactivity above two times background levels. The field instrumentation to guide the excavation and screen the excavated materials will include NaI scintillation detectors, beta-gamma radiation (Geiger-Mueller tube) pancake detectors, and

alpha radiation scintillation detectors. Samples will be collected from both categories of excavated material and submitted for laboratory analysis. The laboratory analysis will confirm that the materials designated for off-site disposal contain thorium at levels above the NRC release criteria (10 pCi/g) and that those designated to remain on site do not contain thorium in excess of this level. Soil samples will also be collected from the excavation (Section 7.4) to confirm that the soils in the excavation meet the NRC release criteria.

3.3 EXCAVATION LIMITS AND CONTROL

Excavation will be guided by a health physics technician using a portable field instrument. Field radiological surveys and excavation control will be performed with a field instrument for detection of low energy radiation. This instrument is designed to detect low-energy photons or alpha particles such as those emitted by Th-232. It utilizes a sodium iodide probe with a diameter of 5 inches and a thickness of 0.25 inch. Solid state electronics facilitate field use and provide durability.

The health physics technician and the excavator will work closely to guide excavation with maximum precision to remove contaminated soils with minimum excavation of uncontaminated materials. The goal will be remediation with minimum soil removal and disposal. Field testing will be performed continuously during excavation activities to direct those activities and to reduce excavation of uncontaminated soils.

Samples will be collected in the field and sent to the off-site laboratory for Th-232 content analysis. These samples will be analyzed on a rapid laboratory response basis, and the results will be compared with field instrument readings made for each sample at the time of collection. The objective of this testing program will be to construct an approximate correlation between field instrument readings and Th-232 contents. This correlation will be used as an aid in guiding the excavation, sorting the material, and setting excavation limits. In any case, field results will be confirmed with laboratory tests for both identification of material for off-site disposal and verification of completed excavation.

3.4 CONCRETE CLEANING

Surface readings and swipe samples of exposed surfaces of the concrete slab and on the fence post foundations will be collected during excavation activities and analyzed for both fixed and removable contamination. If these results indicate surface contamination in excess of the criteria established in NRC, August 1987, the contaminated surfaces will be cleaned with concrete scabbers and/or needle scalers. Appropriate high-efficiency particulate air- (HEPA-) filtered ventilation exhaust will be employed at the point of active surface cleaning to prevent dust dispersion and to collect the concrete dust and cuttings.

Concrete surfaces will be evaluated for beta-gamma radiation with a Geiger-Mueller tube pancake detector and for alpha radiation with an alpha scintillation detector. Fixed contamination will be evaluated by direct surveys; movable contamination will be checked by collecting wipe samples and counting the samples with these instruments. Cleaning and/or grinding will continue until test results for fixed and removable contamination meet applicable NRC criteria.

3.5 MATERIAL STAGING

Excavated materials (soils and concrete) which are believed to contain Th-232, based on the results of the field screening, will be stockpiled in a secured area near the excavation and within the control zone. The materials will be underlain and covered (during nonworking hours) by polyethylene sheeting. The materials will remain in the stockpile until appropriate analyses are performed and containerization or loading is selected for disposal.

3.6 MATERIAL TESTING

Both the apparently thorium-contaminated and clean stockpiles of materials will be resurveyed using the hand-held radiation counter upon completion of excavating. Based on the results of this screening compared to the two-times background standard, both piles may be re-sorted and placed as appropriate in thorium-contaminated and clean staging areas. Representative samples of

both materials will be collected and submitted for laboratory analysis of gross alpha, thorium, and uranium following the procedures discussed in Section 7.4. Only those materials which are confirmed to contain thorium in excess of NRC release criteria (BTPP) by the analytical laboratory will be prepared for off-site disposal.

4.0 SHIPMENT PREPARATIONS

It is currently anticipated that the thorium-contaminated material will be disposed as NORM at Envirocare. Transportation and disposal of these soil type materials will be in bulk.

4.1 GENERAL

A licensed transport company, operated independently or in coordination with the selected disposal site, will be used to transfer the thorium-contaminated materials from the Alcoa site to the approved disposal site. In order to provide the most efficient service, only one transport company will be used.

One copy of all manifests will be retained at the job site; another copy will be sent to the disposal site. The original manifest will accompany the load from the point of origin to the disposal destination with the shipment.

4.2. LOADING

Bulk shipments will be loaded directly from the staging pile to the dump trailer using a front-end loader or equivalent. Appropriate controls will be applied to prevent contamination of vehicle exteriors during loading. The trailer will be lined with a six-mil polyethylene liner. Following loading, the liner will

be closed and taped or otherwise secured over the material. A separate six-mil polyethylene sheet will then be placed over the closed liner. The final cover will be a regular tarpaulin which will be placed over the sheeting, closed liner, and materials.

4.3 MANIFESTS

For bulk shipments, the total activity in each load will be estimated by multiplying the net weight of the load by the average activity concentration for the waste materials. The shipping manifest, with single entry for the trailer as a container, will be prepared in an appropriate two-page form provided by the disposal site. A Document Number will be obtained from the Alcoa project engineer for each manifest prior to document completion and shipment release. This Document Number will appear on the face of the manifest's first sheet.

4.4 TRAILER SURVEYS

After loading and load covering, appropriate radiation and removable contamination surveys will be performed and documented on standard survey forms. A typical radiation survey of a transport vehicle includes the following:

- Center of trailer undercarriage in contact with the outside of the trailer body (one reading)
- Center of each side of the trailer in contact with the outside of the trailer body (two readings)
- Center of each side of the trailer, two meters out, on a perpendicular line, from the outside of the trailer body (two readings)

- Center of trailer tailgate in contact with the outside of the tailgate (one reading)
- Center of trailer tailgate, two meters out, on a perpendicular line, from the outside of the tailgate (one reading)
- Driver's seat or sleeper bunk (whichever is closer to front of trailer) in tractor (one reading).

Removable contamination surveys will be performed and documented to confirm the absence of contaminated materials on the external surfaces of the loaded transport vehicles. The radiation and removable contamination survey results will be recorded on a preprinted form (Figure 4) and included with the shipping documents. Readings will be recorded in millirems per hour.

4.5 EXCLUSIVE USE DOCUMENTATION

Shipments will be made in accordance with DOT rules for radioactive low specific activity (LSA) exclusive use rules (49 CFR 173.425). Documentation will include the waste manifests (Section 4.3), vehicle survey forms (Section 4.4, and exclusive use instructions defining the transportation route, reporting procedures, and emergency procedures. These documents will remain with each shipment from the point of origin to the disposal destination.

4.6 TRUCK WEIGHING AND RELEASE

Following loading and surveying and completion of documentation, each truck will be weighed on site. The gross vehicle weight will be noted on the manifest and exclusive use instructions. After sign-off of the manifests and exclusive use documents by the "Radioactive Waste Shipper," the generator (Alcoa), and the driver, the truck will be released from the site. The disposal site and disposal site host state control agency (if necessary) will be notified by telephone by the Contractor of the release of the vehicle from the site. The waste manifests and shipping papers will be transmitted by facsimile to the disposal site and state control agency (if necessary).

5.0 TRANSPORTATION AND DISPOSAL

5.1 MATERIAL TRANSPORTATION

The Contractor and transportation subcontractor will identify the most direct and appropriate major highway route between the project site and the disposal site. This route will subsequently be used for transportation of those thorium-contaminated materials which are removed from the area of concern during this remediation program.

All transportation activities, as performed by the subcontractor, will be in accordance with DOT regulations, as mandated by federal regulations, including:

- Exclusive Use - 49 CFR 173.425
- Carriage by Public Highway - 49 CFR 177
- Transporter Financial Responsibility - 49 CFR 387
- Driving and Parking Criteria - 49 CFR 397.

Bills of lading will accompany each shipment from the Alcoa site to the disposal site for confirmation of receipt. Copies of the completed forms (including signature of receipt) will be forwarded to Alcoa and contained within the final report to the NRC.

5.2 MATERIAL DISPOSAL

The Contractor will identify an appropriate disposal site for the excavated materials. The disposal site will be approved by Alcoa prior to initiation of excavating activities. The selected site

will have the appropriate licenses and permits which will be provided to the Contractor on request. All disposal activities will conform with the NRC and appropriate state regulations.

Written confirmation of proper disposal will be provided by the disposal subcontractor to the Contractor and Alcoa. Copies of the confirmatory documents will be included in the project report to the NRC.

6.0 VERIFICATION SURVEYS

Verification surveys and sampling will be performed in accordance with the applicable guidelines of NUREG CR-2082 and finally compared to the regulatory radiological release criteria of the BTPP and NRC, August 1987 to document satisfactory completion of the excavation and radiological assessment of the thorium-contaminated materials discussed in this plan.

6.1 ESTABLISHMENT OF SURVEY GRID

A uniform survey grid of 20 feet by 20 feet will be established for the excavation area anticipated to be approximately 20 feet by 100 feet. Additional survey grids will be used for concrete vertical surfaces of the slab, which is expected to be exposed at the north perimeter of the anticipated excavation area. Grid identifications shall be clearly marked or staked to ensure survey and sample repeatability within a designated grid.

Formal survey maps will be constructed which indicate the grid locations and sample/survey points within that grid, and the survey grid area(s) will be referenced to a fixed site reference point.

6.2 SURVEY AND SAMPLING OF SOIL GRIDS

The following survey and sampling methodology will be effected for excavation area soil grids and fully documented on the respective formal survey forms.

6.2.1 Surface Surveys

Surface surveys of the grid will be performed using the 2-inch by 2-inch NaI gamma scintillation detector held within 3 inches of the surface, and the survey will traverse the entire grid surface. Radiation survey data (cubic centimeters per minute for the maximum, minimum, and average radiation level will be recorded for each of the four 10-foot by 10-foot grid quadrants within each 20-foot by 20-foot grid.

Comparative background radiation level measurements will be taken from an on-site area(s). Those background reference point measurement readings will be clearly shown on a survey map and documented in the same manner as the verification surveys. It is anticipated that the actual excavation area will be a shallow excavation, and, therefore, background surface soil measurements should be readily comparable to the shallow excavation measurements.

6.2.2 Gamma Radiation Exposure Rate Measurements

Gamma radiation exposure rate measurements will be performed for each of the grids using a gamma scintillation micro-R detection instrument (Ludlum Model 19 or equivalent). Five measurements at 1 meter above the surface will be recorded: four measurements at the centroid of each of the 10-foot by 10-foot grid quadrants and one measurement at the centroid of the 20-foot by 20-foot grid. Gamma exposure rate measurements will be compared to background measurements located and documented in the same manner as the surface surveys discussed in Section 6.2.1.

6.2.3 Soil Samples

A total of five soil samples will be taken from each 20-foot by 20-foot grid representative of 6 inches (15 centimeters) of the residual soil surface. Four of the sample locations will be biased to the maximum surface measurement result of Section 6.2.1 in each of the 10-foot by 10-foot grid quadrants, and the remaining sample will be randomly chosen from the grid. Sample locations and surface measurement results will be clearly shown on the respective survey maps.

The five samples from each grid will be composited into one laboratory sample and one replicate sample. Composited samples will be clearly marked, labeled, and identified with appropriate grid identification numbers. Each composite from one grid will be prepared for transfer to the analytical laboratory for gamma

spectroscopy analysis in accordance with the laboratory instructions, including the Chain of Custody Record form and Request for Analysis form. Each sample will be analyzed for Th-232 and U-238 radioactivity concentrations with the results reported in pCi/g of each isotope.

The laboratory will be requested to provide expedited analysis. Each of the two composites per grid will be less than 10 pCi/g for Th-232 and less than 35 pCi/g for U-238 for qualification of the grid as meeting the unrestricted residual contamination regulatory limit.

6.3 SURVEY OF CONCRETE SURFACES

Concrete surfaces will be surveyed, cleaned, and decontaminated, if required, and radiation surveys performed as described below:

- Establish a survey grid with the grid size as required for smaller concrete areas
- Scan the entire surface of each grid and record five direct radiation measurements within each grid using a beta-gamma Geiger-Mueller tube pancake detector and record the results in disintegrations per minute (dpm) per 100 square centimeters (cm^2)
- Perform five direct alpha radiation measurements at each of the five beta-gamma reading locations identified during the direct radiation scanning and record the results in dpm/100 cm^2
- Perform five movable contamination swipe measurements within each grid and analyze the swipes with a beta-gamma and alpha scaler and record the results in dpm/100 cm^2
- Fully document the radiation survey results and compare to the allowable residual contamination levels of NRC, August 1987 for unrestricted release determination of the grid area.

6.4 INSTRUMENTATION AND DOCUMENTATION

Radiation detection instrumentation will be used and maintained in accordance with radiological program procedures and by qualified radiological personnel.

6.4.1 Instrumentation Calibration

Instrumentation will be calibrated in accordance with the American National Standards Institute standards prior to on-site use and within six months of the calibration date. Calibration sheets will be maintained in the project files.

6.4.2 Instrument Response Checks

Daily instrument response checks will be performed and documented using appropriate radiation sources for the instrument response. Determination of counting efficiency for scaler instrumentation will be performed with certified radiation standards with secondary traceability to the National Institute for Standards and Technology.

6.4.3 Radiation Survey and Instrumentation Forms

Radiation survey forms and instrumentation forms will be dated and signed by qualified radiological personnel and maintained with the project records.

6.4.4 Documentation and Survey Results Review

Radiological forms and survey results for air sampling, direct radiation surveys, and results of laboratory analysis will be reviewed by the project HSO and maintained in the project record file for inclusion into the final project report. The Contractor's SOPs and other project instructions will be maintained on site during project operations.

6.5 SOIL SAMPLE NOMENCLATURE

The sample numbers, used on the labels, will identify the grid area from which the material was collected. The numbers will identify the upper right (northeast) and lower left (southwest) point of intersection of the grid lines which form the grid area. For instance the composite sample collected from the grid bounded by the A- and B-grid lines and 1- and 2-grid lines (Figure 2) will be designated A1-B2. Surface soil samples will be designated with an "S." Within each grid, samples will be assigned unique numbers in the order of collection. For example, Sample No. A1-B2-S-3 would designate the third surface soil sample collected in grid A1-B2. A replicate sample will be prepared for one in five matrix samples collected and submitted for laboratory analysis. Replicate samples will be identified using and "R" prefix (RA1-B2). The results of the replicate and sample will be compared to evaluate the quality of compositing in the field.

6.6 AGENCY COORDINATION

The Contractor's supervisory personnel will cooperate with regulatory representatives of cognizant local, state, and NRC/ORAU organizations during project performance. All field records will be available on site for agencies' review. Access to the site will be coordinated with Alcoa. It is anticipated that NRC/ORAU and the Contractor will coordinate survey and sampling activities and perform split sample analysis to confirm the Contractor's analytical methods.

6.7 QUALITY ASSURANCE

Field activities will be performed in compliance with the Contractor's program for quality assurance. This program will ensure that activities are performed and documented in accordance with approved plans, procedures, and instructions.

7.0 DEMOBILIZATION

7.1 EQUIPMENT DECONTAMINATION

The equipment (backhoe, shovels, forklifts, roll-off boxes, etc.) used on site in direct contact with thorium-contaminated materials will be cleaned and surveyed prior to off-site release. Cleaning will be performed with clean damp rags and brushes, as necessary, to thoroughly decontaminate the equipment. Prior to release of tools and equipment from the RCA, surveys for fixed and removable contamination will be performed and documented. The results of these surveys will be compared to the criteria of NRC, August 1987 to confirm the acceptability of each surveyed item for unrestricted release. Additional cleaning, surveying, and swiping will be performed until the release criteria for off-site use is attained. Survey information will be recorded in the field logbook.

7.2 ACCESS CONTROLS REMOVAL

Following the excavation and off-site removal of thorium-contaminated materials, completion of the verification survey, NRC confirmation of completed remediation, and release and removal of equipment, the Contractor will remove all barricades, signs, etc., which restricted access to the area of concern.

7.3 EXCAVATION BACKFILL

Following the excavation of thorium-contaminated materials, completion of the verification survey, and NRC confirmation of completed remediation, clean backfill, obtained from an off-site source, will be placed in the excavation. The backfill will be brought to the original grade and compacted. Only equipment which is confirmed as clean (Section 7.1) or new equipment not involved in the excavation or handling of the excavated materials will be used for backfilling.

Subsequent to the backfilling, the fence line on the property boundary between Alcoa and N&SS will be reinstalled.

7.4 WORKER MONITORING

Following the completion of all field activities, the dosimeters will be collected, and the on-site workers will be required to repeat bioassay (urinalysis) testing. The Contractor will prepare an updated NRC Form 4 for each worker using the dosimeter and bioassay test results for this project. The results of the worker monitoring analyses will be appended to the final report to the NRC.

7.5 DISPOSAL OF NONSOIL ITEMS

During the work, contaminated nonsoil items will be collected in drums. These materials will include cleaning rags and brushes, coveralls, gloves, boot covers, polyethylene sheeting, and other

items. When appropriate, materials of these types will be surveyed for contamination and segregated as contaminated and clean items to reduce the volume of material designated as low-level radioactive waste (LLRW). The filled drums will be closed, cleaned, and marked for shipment as LSA material. Arrangements will be made for a properly licensed LSA waste processor to accept the drums, transport them to a treatment facility, compact the contents, and dispose of the material at an NRC-licensed LLRW disposal site.

8.0 FINAL REPORT

A report will be prepared by the Contractor following the completion of all field activities and receipt and management of field and laboratory data. The report will include, but not be limited to, the following information:

- Review of field activities and methodologies
- Schematic maps of verification grid lines, sample locations (soil, swipe, and survey), and survey data
- Field logs with survey and swipe data
- Contour map of final excavation
- Field calibration logs
- Field logbook and related records
- Bills of lading, waste manifests, etc.
- Disposal subcontractor's written receipt of material
- Chain-of-Custody Record and Request for Analysis forms
- Laboratory data for air and soil samples
- Health physics data
- Miscellaneous environmental monitoring data.

A draft report will be submitted to Alcoa for review prior to finalization of the document for submittal to the NRC and the Ohio Department of Health.

9.0 PROJECT SCHEDULE

Based on the work plan described in Chapters 2.0 through 8.0 and on schedule input from the NRC, Alcoa, and other projects, a critical path schedule has been prepared in bar chart form. This schedule includes work plan finalization, remediation contractor procurement, disposal arrangements, and transportation arrangements. The schedule bar chart is shown in Figure 5.

The principal work items and target completion dates are as follows:

Work Item	Target Completion Date
<u>Work Plan:</u>	
• Work plan (including HASP, RCP, and SOPs)	June 15, 1991 (CP)
• Alcoa reviews (A)	June 19, 1991 (CP)
• Edit and print	June 21, 1991 (CP)
• NRC reviews and approvals	July 12, 1991*
<u>Contractor Procurement:</u>	
• Construction specifications (A)	July 5, 1991 (CP)
• Bidding process	August 2, 1991 (CP)
• Bid reviews (A)	August 15, 1991 (CP)
• Place contract and notice to proceed (A)	August 25, 1991 (CP)
<u>Disposal Arrangements:</u>	
• Conditions acceptance (A)	June 21, 1991
• Contract review (A)	July 12, 1991
• Generator state release	July 12, 1991

Work Item	Target Completion Date
<u>Disposal Arrangements (Continued):</u>	
• Sample collection and analysis	July 12, 1991
• Material acceptance	July 26, 1991
• Site audit	July 19, 1991
• Disposal contract	July 26, 1991
<u>Transportation Arrangements:</u>	
• Identify disposal site and haul route	Complete
• Qualify candidate haulers (including pricing)	June 28, 1991
• Contract review (A)	July 26, 1991
• Transporter audit	July 19, 1991
• Transportation procedures	June 28, 1991
• Transportation contract	August 2, 1991
<u>Mobilization:</u>	
• Procure materials, supplies, and equipment	September 6, 1991 (CP)
• Medical testing and training	August 30, 1991
• Site setup	September 6, 1991 (CP)
• Fence and utility removal	September 6, 1991
<u>Excavation:</u>	
• Materials removal and sorting	September 13, 1991 (CP)
• Concrete cleaning	September 13, 1991 (CP)
• Excavated material testing	September 25, 1991
• Material staging	September 27, 1991
<u>Verification:</u>	
• Field gridding, surveys, and sampling	September 20, 1991 (CP)
• Sample analysis (off-site laboratory)	October 4, 1991 (CP)
• Data compilation	October 11, 1991 (CP)
• NRC review and independent testing	October 18, 1991 (CP)*
• NRC release	November 15, 1991 (CP)*

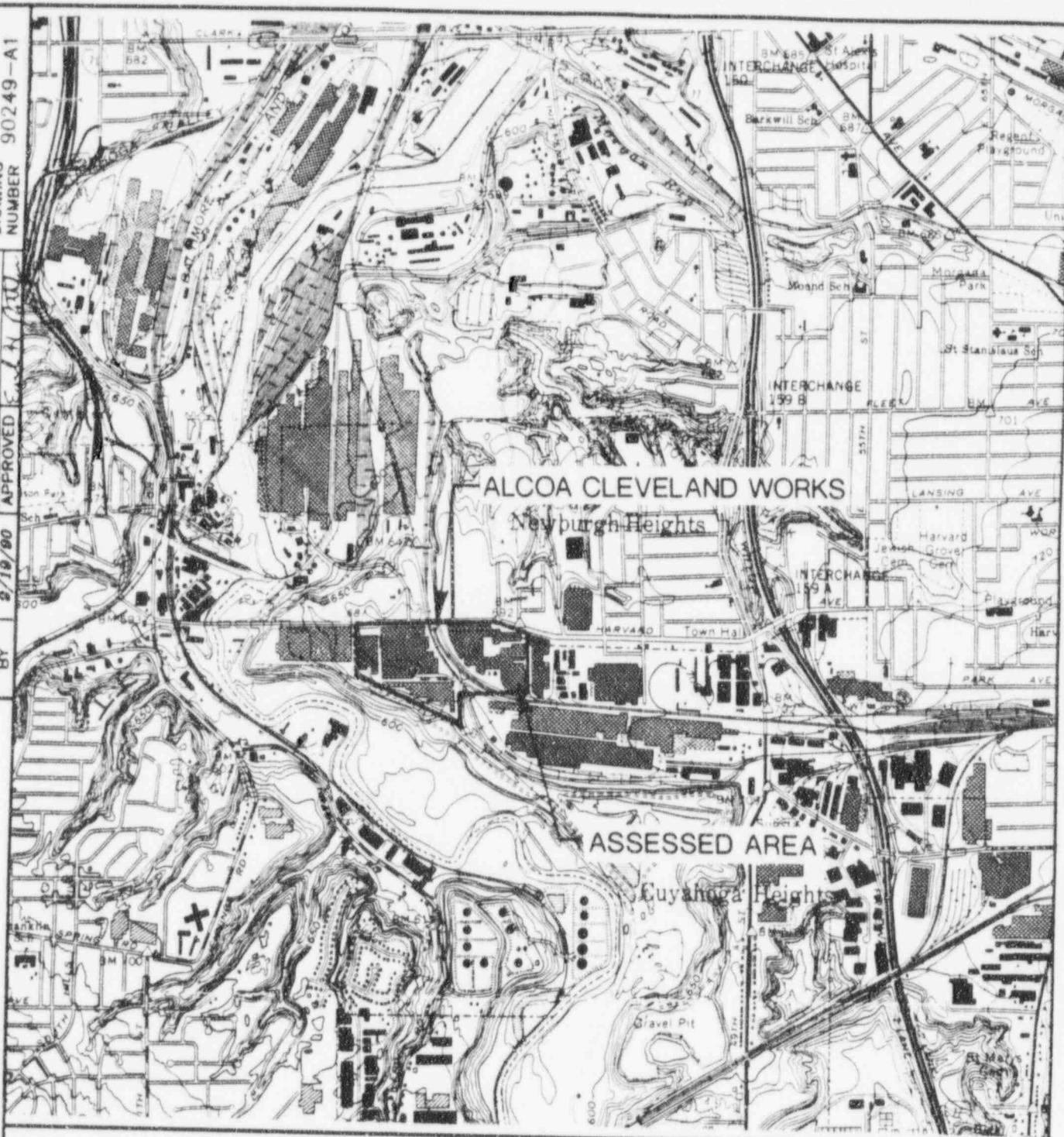
<u>Work Item</u>	<u>Target Completion Date</u>
<u>Shipment and Disposal:</u>	
• Material loading	October 4, 1991
• Trailer surveys and documentation	October 4, 1991
• Travel time	October 9, 1991
• Disposal and confirmation	October 18, 1991
<u>Demobilization:</u>	
• Equipment decontamination and site release	October 11, 1991
• Backfill and restoration	October 18, 1991
• Medical testing and documentation	October 18, 1991
• Disposal of nonsoil items	October 25, 1991
<u>Final Report:</u>	
• Draft report	October 25, 1991
• Alcoa review (A)	November 1, 1991
• Final edit and submission	November 8, 1991

Notes:

(CP) indicates critical path work item.

* indicates NRC estimated duration not subject to Alcoa or contractor control.

(A) indicates Alcoa action item.

RAWN
BY

SCALE, FEET

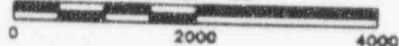


FIGURE 1

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

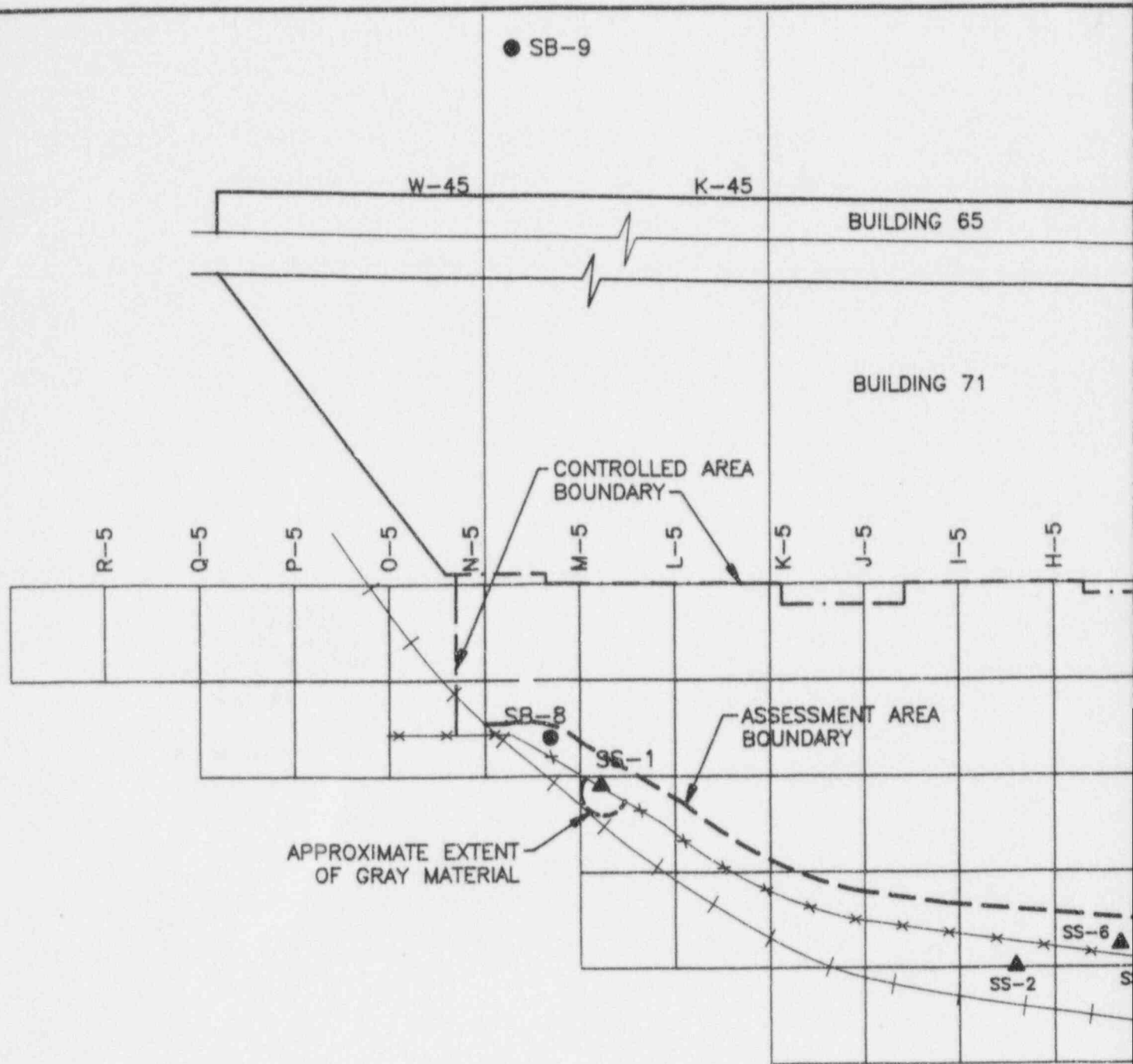
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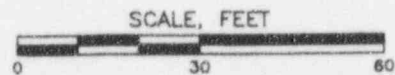
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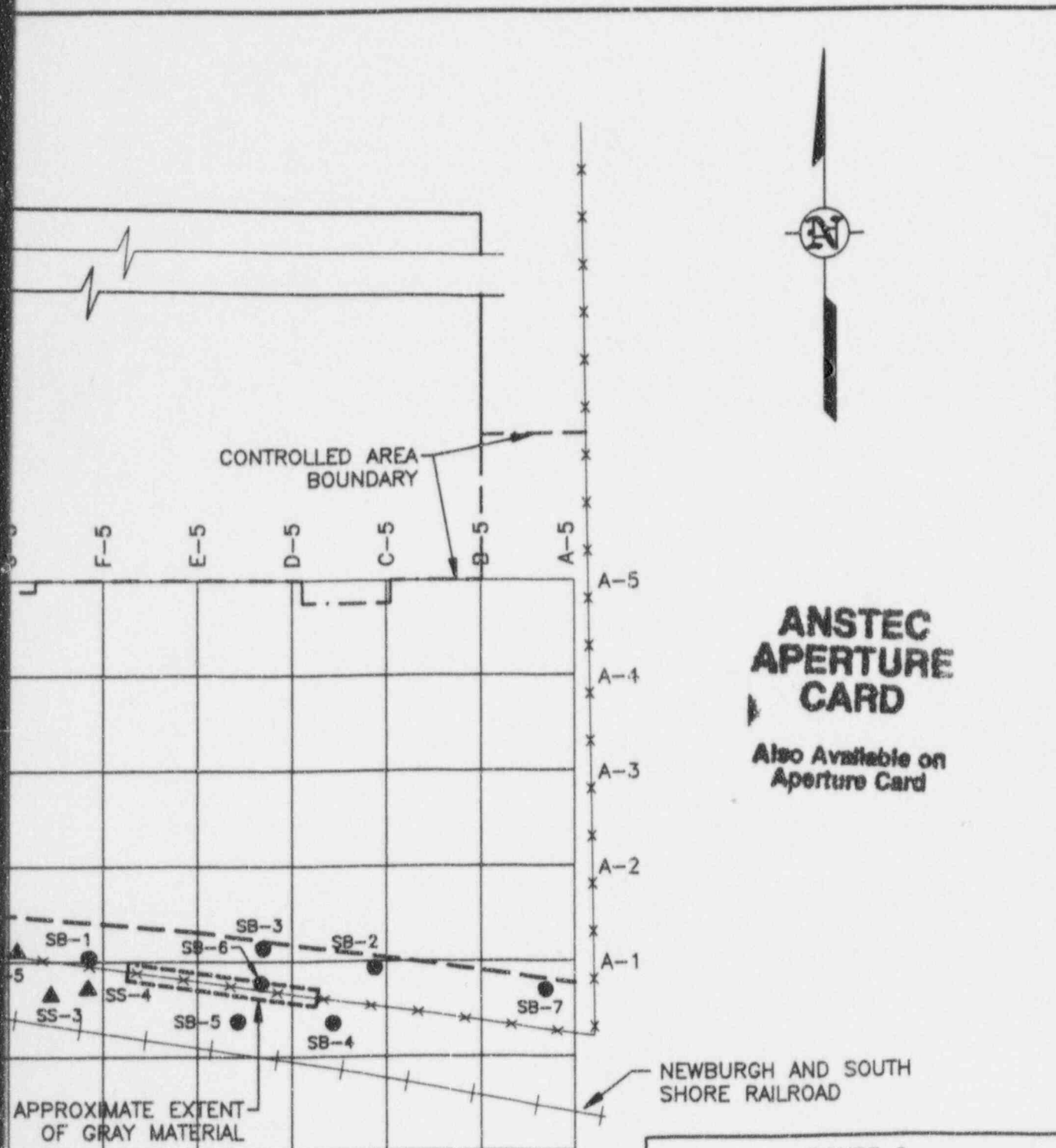
DRAWN BY



REFERENCE:

NUS, NOVEMBER 1989.





9707070386-01

LEGEND:

- SOIL BORING LOCATION
- ▲ SURFACE SAMPLE LOCATION

FIGURE 2

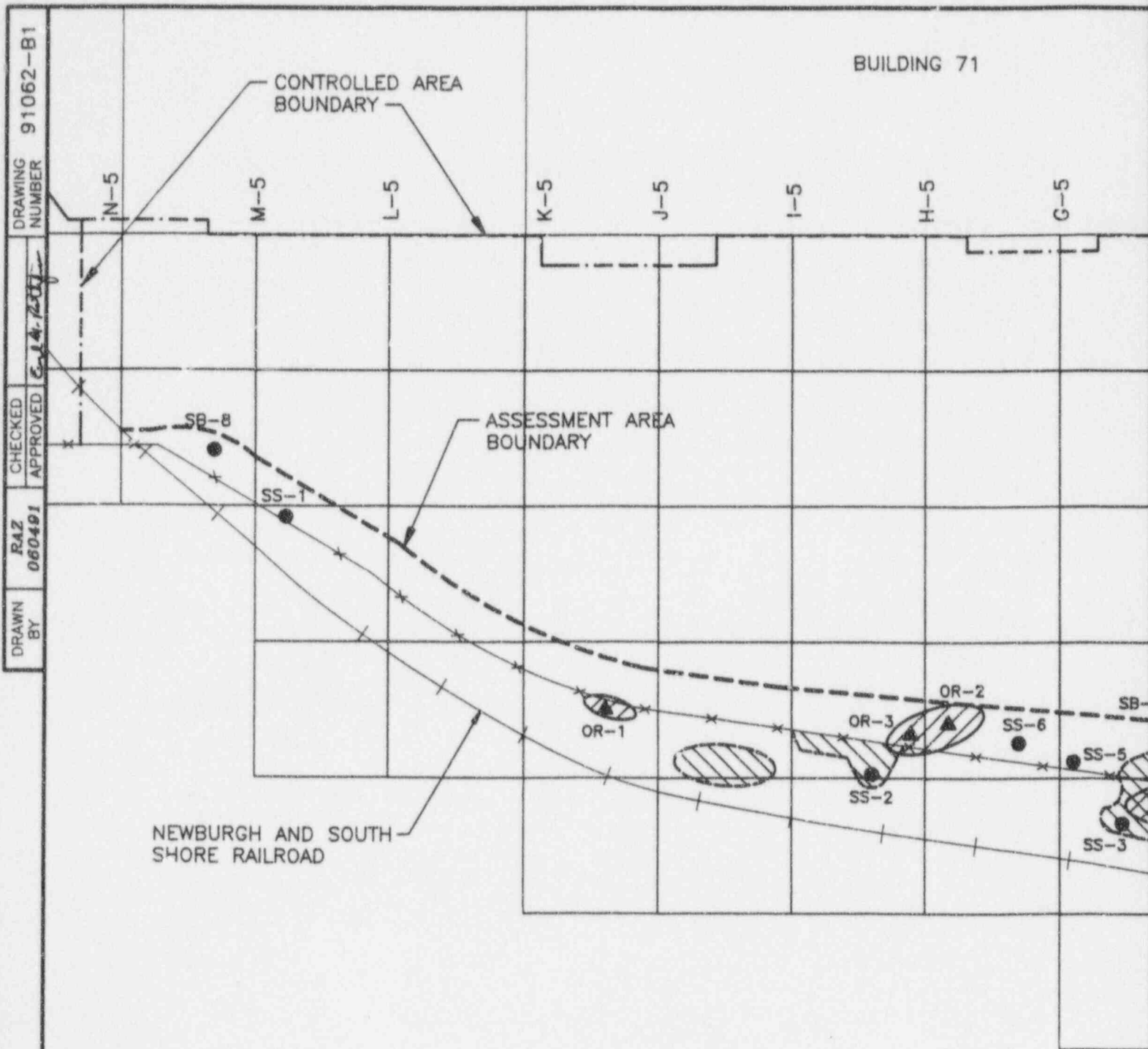
SOIL BORING AND
SURFACE SAMPLE LOCATIONS

ALCOA
CLEVELAND WORKS

PREPARED FOR

ALCOA
CLEVELAND, OHIO





LEGEND:



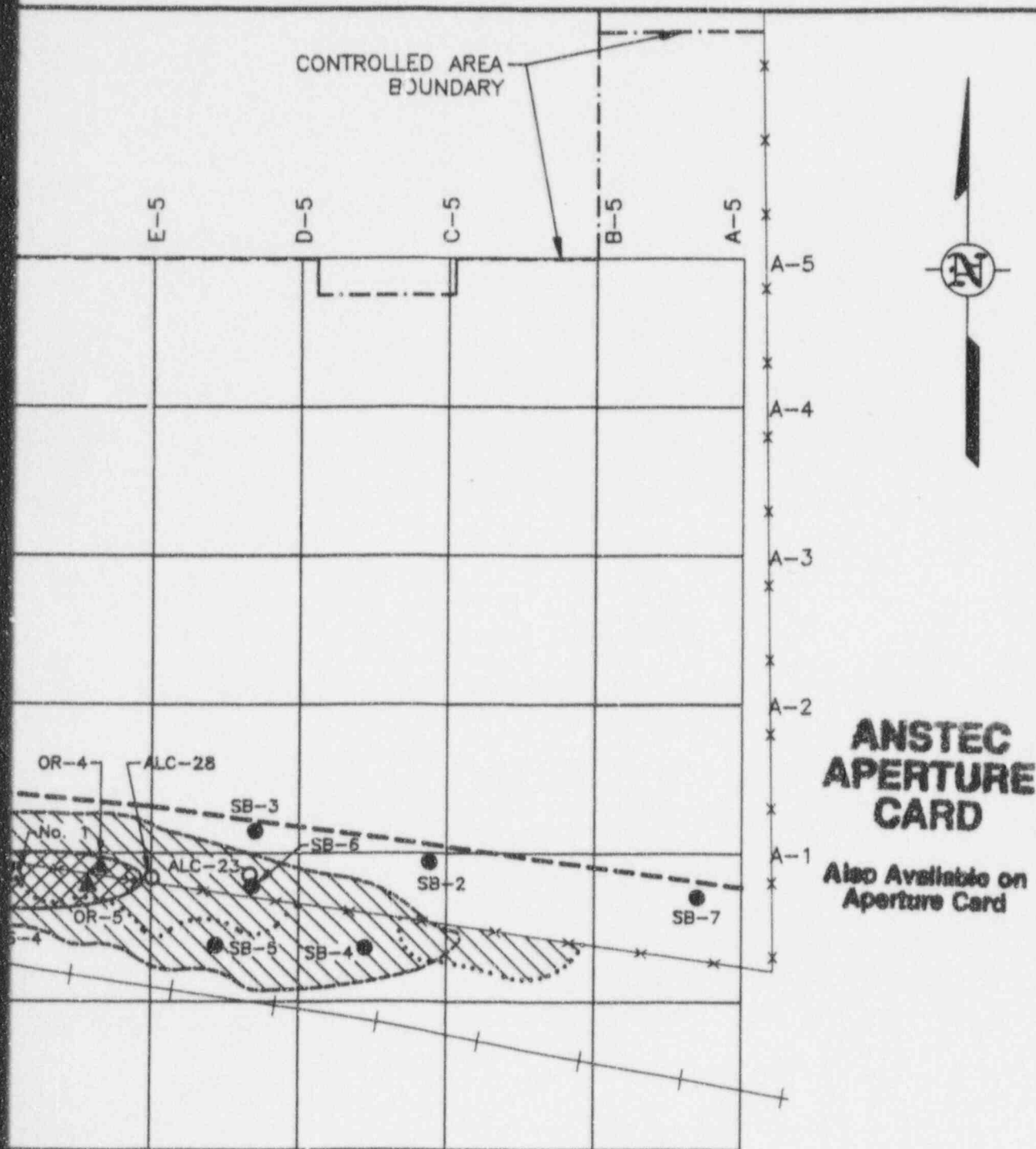
ESTIMATED AREAS OF SUSPECTED TH-232 CONTAMINATION (>15 $\mu\text{rem/hr}$ OR 100 ccpm) AS INDICATED ON FIGURE 3 FROM INDIRECT MEASUREMENTS (i.e. FIELD SCREEN)



ESTIMATED AREAS OF TH-232 CONTAMINATION (>10 pCi/g) AS INDICATED BY ANALYTICAL RESULTS

REFERENCE:

NUS, NOVEMBER 1989.



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SCALE, FEET
0 20 40

FIGURE 3

ESTIMATED AREA OF
TH-232 CONTAMINATION

ALCOA
CLEVELAND, OHIO

PREPARED FOR
ALCOA
CLEVELAND WORKS

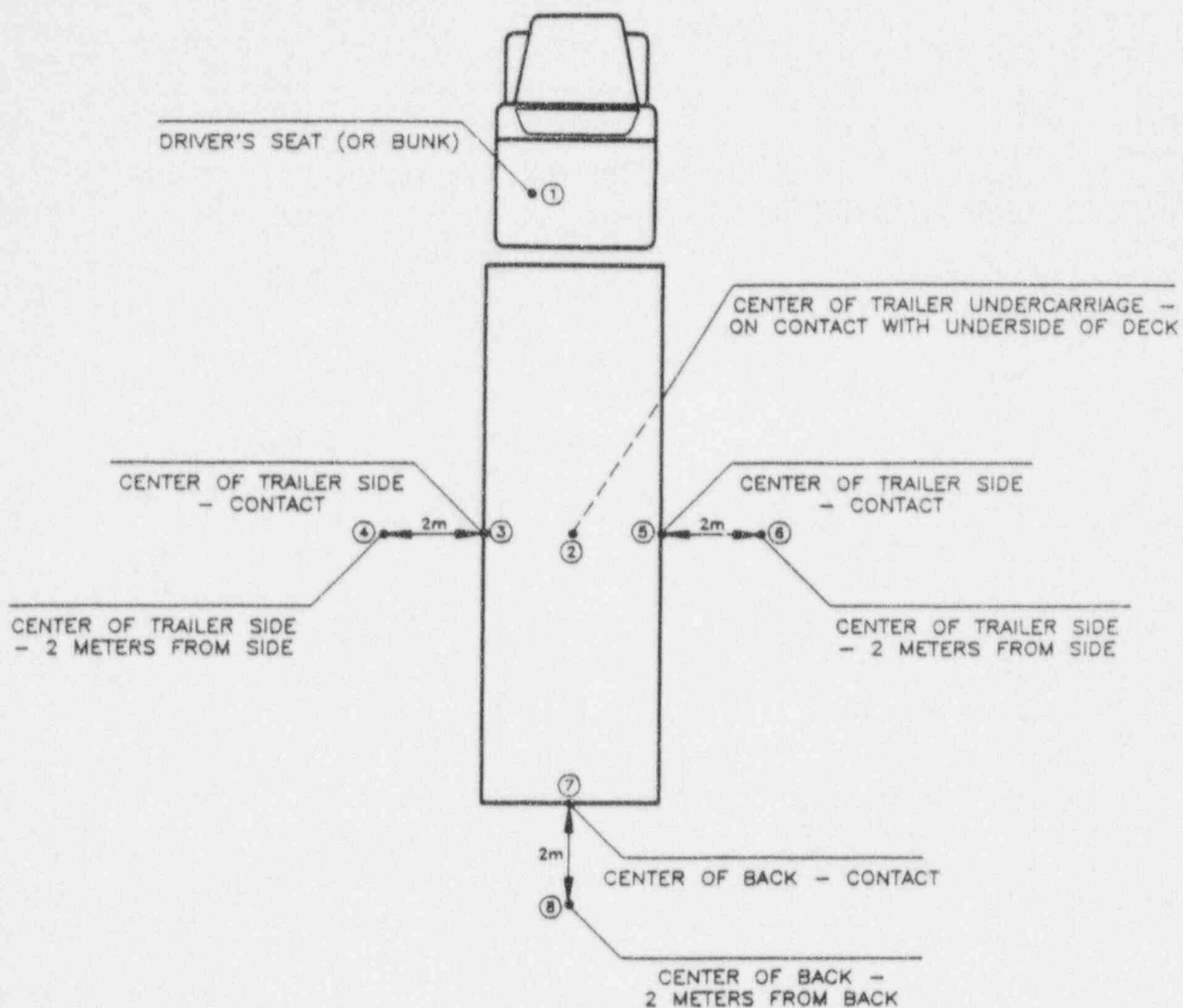
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FIGURE 4

LOW SPECIFIC ACTIVITY
RADIOACTIVE MATERIAL SHIPMENT
EXCLUSIVE USE TRUCK & TRAILER SURVEY FORM
(BULK SHIPMENT)

**DUMP TRAILER**

(NOT TO SCALE)

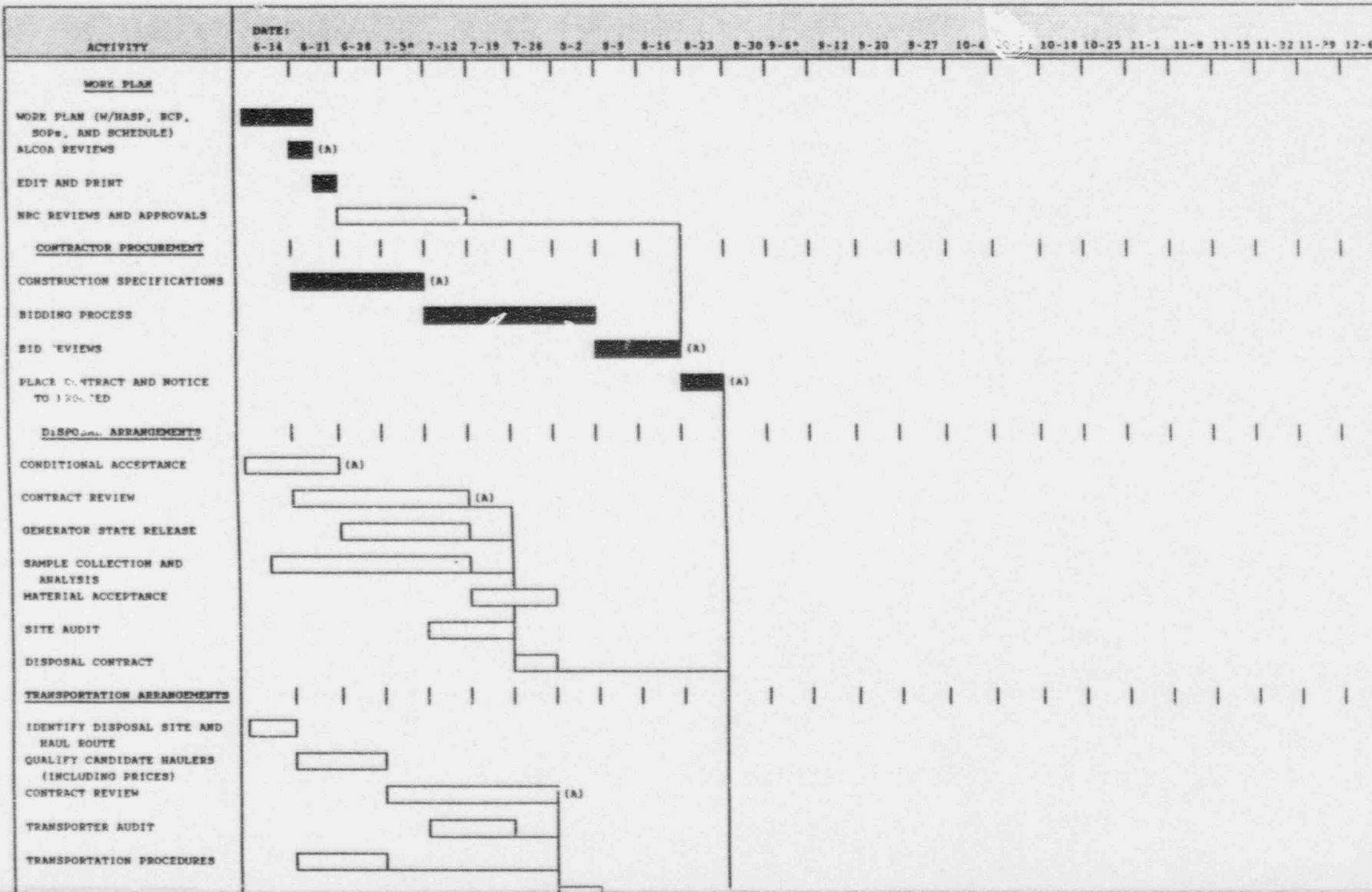
SURVEYOR: _____ SURVEY EQUIPMENT USED: _____

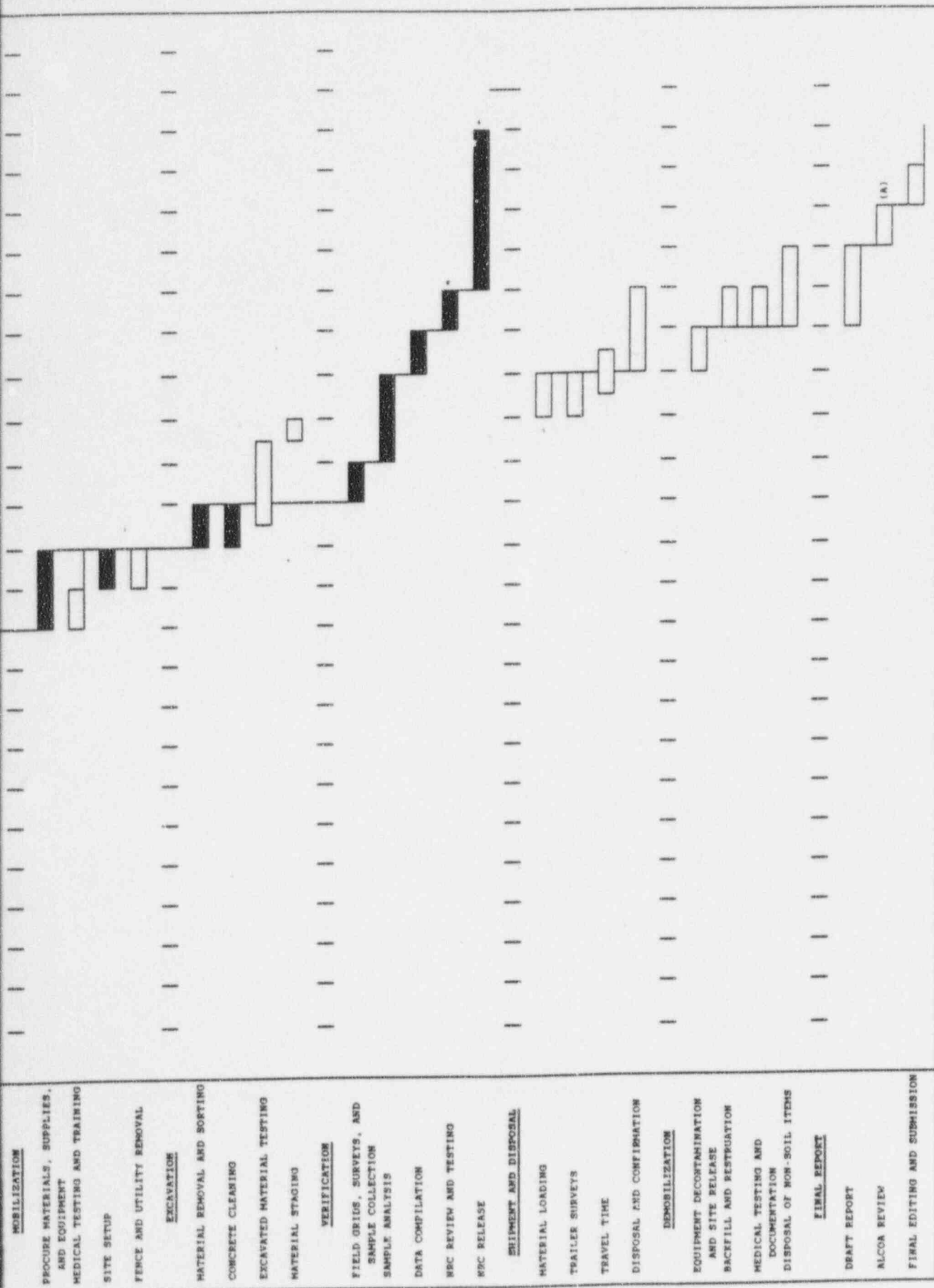
DATE OF SURVEY: _____ TOTAL ACTIVITY OF LOAD: _____

TRAILER OWNER: _____ TRAILER NUMBER: _____

TRANSPORTATION COMPANY: _____ DRIVER: _____

FIGURE 5
BAR CHART SCHEDULE
THORIUM AREA REMEDIATION
ALUMINUM COMPANY OF AMERICA
CLEVELAND WORKS
PROJECT NO. 91062





**ANSTEC
APERTURE
CARD**

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