# IMPLEMENTATION PLAN FOR AREA 2, PHASE I NON-WASTE UNITS PERIMETER AREAS

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| A1PI | Area 1, Phase I |
| A1PII | Area 1, Phase II |
| A2PI | Area 2, Phase I |
| A2PII | Area 2, Phase II |
| A2PIII | Area 2, Phase III |
| ACA | Amended Consent Agreement |
| ACHP | Advisory Council on Historic Preservation |
| AFP | Active Flyash Pile |
| ALARA | as low as reasonably achievable |
| ARAR | applicable or relevant and appropriate requirement |
| ASCOC | area-specific constituent of concern |
| CDL | certification design letter |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| CFR | Code of Federal Regulations |
| COC | constituent of concern |
| COE | U.S. Army Corps of Engineers |
| CRDL | Contract-required detection limits |
| DCN | Design Change Notice |
| DOE | U.S. Department of Energy |
| EPA | U.S. Environmental Protection Agency |
| EWF | Equipment Wash Facility |
| FEMP | Fernald Environmental Management Project |
| FRL | final remediation level |
| HPGe | high-purity germanium (detector) |
| IFP | Inactive Flyash Pile |
| IMPP | Impacted Materials Placement Plan |
| IRDP | Integrated Remedial Design Package |
| NIMS | Non-Impacted Material Stockpile |
| NPDES | National Pollutant Discharge Elimination System |
| NRRP | National Resource Restoration Plan |
| NRT | Natural Resource Trustee |
| NWU | Non-Waste Unit |
| OEPA | Ohio Environmental Protection Agency |
| OHPO | Ohio Historical Preservation Office |
| OSDF | On-Site Disposal Facility |
| OU | Operable Unit |
| PPE | personal protective equipment |
| ppm | parts per million |
| PSP | project-specific plan |
| QA/QC | quality assurance/quality control |
| RA | remedial design/remedial action |
| RI/FS | remedial investigation/feasibility study |
| ROD | Record of Decision |
| RSS | Radiation Scanning System |
| RTRAK | Radiation Tracking System |
| SED | Sitewide Environmental Database |

## LIST OF ACRONYMS AND ABBREVIATIONS
## (Continued)

| | |
|---|---|
| SEP | Sitewide Excavation Plan |
| SF | South Field |
| SMTA | Special Material Transfer Area |
| SP | soil stockpile |
| SSOD | Storm Sewer Outfall Ditch |
| SWPPP | Stormwater Pollution Prevention Plan |
| SWUs | Southern Waste Units |
| TBC | to be considered |
| WAC | waste acceptance criteria |
| WAO | Waste Acceptance Organization |
| WPRAP | Waste Pits Remedial Action Project |
| $yd^3$ | cubic yards |

# EXECUTIVE SUMMARY

This Implementation Plan describes the remediation of soil and at- and below-grade debris in a portion of the Area 2, Phase I (A2PI) Non-Waste Units (referred to as the Perimeter Area) at the Fernald Environmental Management Project. The Perimeter Area is located in the southern portion of the FEMP site, surrounding the former A2PI Southern Waste Units (SWUs).

Predesign investigations have indicated the presence of flyash at several locations, and various surface water management features installed for the SWU remediation need to be removed. Sampling within the former SWUs has shown that portions of the subsurface exceed the final remediation levels for A2PI constituents of concern; the remediation of these areas is also presented for information in this Implementation Plan.

This Implementation Plan addresses the remedial design/remedial action steps discussed in the Sitewide Excavation Plan (SEP; DOE 1998a) (i.e., predesign investigations, remedial design, remedial action, precertification and interim grading activities) as they pertain to the remediation of the Perimeter Area. Post-remediation precertification and certification will be addressed in future documents (e.g., the Certification Design Letter).

Remedial action in the Perimeter Area involves removing at- and below-grade debris, flyash, and soil containing flyash, which were identified through the predesign investigation. Approximately 14,500 cubic yards ($yd^3$) of flyash and soil will be excavated from the Perimeter Area and transported to the On-Site Disposal Facility (OSDF) for disposal. An estimated 2500 $yd^3$ of debris will be removed, sized to meet the physical waste acceptance criteria (WAC), and transported to the OSDF for disposal. An additional 30,000 $yd^3$ of material will be transported from the former SWU area. Control mechanisms and monitoring/inspection requirements will be established to minimize impacts to natural resources and to air, surface water, and groundwater pathways.

The initial scope of work will include: excavation of above-FRL material in the former South Field; the removal of the existing stockpiles within the former SWUs; excavation of material under the soil/debris/concrete stockpile that remained from the SWU excavation design; excavation of the flyash in the Grassy Knoll area; removal of West Seepage Station and associated utilities, Ditch 2, NIMS No. 1

and underlying footprint (including Ditches 4-6); removing Well House 13; removing a portion of the transfer line, treatment and discharge lines; removing Ditches 3 and 7; removing gravel roads surrounding NIMS No. 1; and removal of Retention Basin 1. The materials will be excavated and transported to the OSDF. A schedule for excavation and placement of the remaining Perimeter Area material in the OSDF remains to be determined pending schedule and funding issues.

The remedial action requirements were developed in accordance with the concepts described in this Implementation Plan, as guided by the OSDF WAC Attainment Plan (DOE 1998b) and the SEP. As the integrating document for the Integrated Remedial Design Package, the Implementation Plan provides a comprehensive description of planned remediation activities.

The remediation of the Perimeter Area is scheduled to begin in Summer 2001. The schedule for completion remains to be determined pending site funding and scheduling issues. A construction subcontractor, the FEMP labor contractor (Wise), or a combination of the two will perform the remediation. Design documents will reflect the approach; drawings and specifications will apply to a subcontractor, whereas a traveler package will govern work by the FEMP labor contractor.

# 1.0 INTRODUCTION

This Implementation Plan describes the U.S. Department of Energy's (DOE) intended remedial activities in the Area 2, Phase I (A2PI) Non-Waste Unit (NWU) Perimeter Area at the Fernald Environmental Management Project (FEMP). It explains how the general remediation strategies set forth in the Sitewide Excavation Plan (SEP; DOE 1998a) will be applied to remediation of A2PI NWUs.

The FEMP site has been divided into ten areas for remediation of soil and at- and below-grade structures and debris. As shown on Figure 1-1, the southwestern corner of the FEMP has been identified as Remediation Area 2. The remediation of this area has been separated into three phases to prioritize removal of material that presents the greatest risk to human health and the environment. As shown on Figure 1-2, A2PI was further divided into the former Southern Waste Units (SWUs) [former Inactive Flyash Pile (IFP), former South Field (SF) and former Active Flyash Pile (AFP)] and the NWUs. The NWUs consist of the Carolina Area, the Perimeter Area, and the area surrounding the former AFP. The remediation of the area surrounding the former AFP was addressed in Design Change Notice (DCN) 20402-100 in Calendar Year 2000. The remediation of the Carolina Area was addressed in DCN 20402-109 and an Implementation Plan (DOE 2000a). This Implementation Plan addresses the Operable Unit (OU) 5 areas adjacent to the former SWUs – the Perimeter Area. The details provided are therefore based on the selected remedies described in the OU5 Record of Decision (ROD; DOE 1996).

All excavation activities will be performed in accordance with the A2PI NWU Perimeter Area Integrated Remedial Design Package (IRDP). The IRDP consists of this Implementation Plan, Technical Specifications, and Construction Drawings. Remedial activities in the A2PI NWU Perimeter Area are in accordance with the OU5 ROD. This Implementation Plan and the SEP satisfy the Amended Consent Agreement (ACA; EPA 1991) requirement for a remedial action (RA) work plan.

The Implementation Plan is the integrating document for the IRDP, and it describes the planned remediation activities. Its purpose is to facilitate regulatory agency review of the remedial design and to summarize the scope of work. Activities described in this plan are being conducted in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). This Implementation Plan conforms to the general model outline for IRDPs provided in Section 7 of the SEP.

## 1.1 SCOPE AND GENERAL APPROACH OF THE IMPLEMENTATION PLAN

This Implementation Plan consists of the following sections:

- Section 1.0 - Introduction, which summarizes the purpose and scope of this Implementation Plan and describes programmatic strategies and requirements for implementation of this remedial action project.

- Section 2.0 - Predesign Investigations, which describes the constituents of concern (COCs) for the A2PI NWU Perimeter Area, summarizes the predesign investigations conducted, the surface and subsurface conditions, the nature and extent of contamination, and the anticipated excavation boundaries.

- Section 3.0 - Remedial Action Approach, which presents the work associated with site preparation, removal of at- and below-grade debris, general excavation to remove contaminated soil, real-time monitoring of the excavation surface, precertification and restoration.

The suggested outline for an Implementation Plan would include the following sections as well:

- Section 4.0 - Project-Specific Environmental Controls and Monitoring, which discusses environmental controls and associated monitoring established with respect to natural resources and air, surface water and groundwater pathways.

- Section 5.0 - Project-Specific Health and Safety, which summarizes project-specific health and safety requirements and procedures.

- Section 6.0 - Remedial Action Management Strategy, which discusses the strategy for managing remediation activities, project organization and responsibilities, waste management activities, data and records management, quality assurance/quality control (QA/QC), and integration of A2PI remediation with other FEMP projects.

The A2PI SWUs Implementation Plan (DOE 1998c) contains all of these sections, and the discussion in the A2PI Implementation Plan adequately addresses the subject matter of these three sections for the Perimeter Area and are therefore not repeated in this Implementation Plan.

The area-specific Remedial Design/Remedial Action process at the FEMP is illustrated on Figure 1-1 of the SEP and involves the following steps:

- Predesign investigations
- Remedial design
- Remedial action
- Precertification of excavated areas

- Certification of excavated areas
- Post-remedial action.

This Implementation Plan covers all of the steps except certification and post-remedial action. As stated in the SEP, a Certification Design Letter (CDL) will be prepared and submitted to the regulatory agencies after the precertification process is complete. The CDL will summarize area remediation, precertification, and design of the certification sampling and analysis program. Restoration activities will be completed after the regulatory agencies approve the Certification Report. Any post-remedial action will follow restoration and be guided on a sitewide basis by the final version of the Natural Resource Restoration Plan (NRRP; DOE 1998d).

Predesign activities began in the Perimeter Area in 1999, as described in the Predesign Sampling Project Specific Plan (PSP) and resulting variances (DOE 1999). The sampling activities have been focused on identifying material that must be excavated due to its nature (i.e., debris, flyash content, contamination, etc.). The Perimeter Area footprint has been surveyed with real-time instruments to assess the presence of radiological contamination, associated with uranium, radium-226, and thorium-232, that is above the final remediation levels (FRLs) established in the OU5 ROD. Physical sampling was also conducted as part of predesign.

The excavation limits presented in the design drawings are based on:

- OU5 Remedial Investigation/Feasibility Study (RI/FS; DOE 1995a and 1995b) data on the nature of COC concentrations in soil
- Data collected during predesign investigations to identify the presence of contamination, flyash, and surface and buried debris.

The final extent of excavation will be based on actual field conditions, radiological field survey measurements (i.e., real-time surveys), and physical sampling results.

Perimeter Area remediation will involve excavating and disposing of impacted material, including any soil containing flyash and/or debris. Impacted material is defined as soil with above-FRL contamination or man-made materials (e.g., flyash). Impacted material that meets the chemical, radiological and physical waste acceptance criteria (WAC) established for the On-Site Disposal Facility (OSDF) will be hauled to the OSDF for disposal. Impacted material that meets the chemical/radiological WAC, but not

the physical WAC, will be size-reduced before disposal in the OSDF. Items that do not meet OSDF WAC or are prohibited from disposal in the OSDF, but meet the Envirocare WAC, will be transported to Soil Stockpile (SP) 7. Any material that fails both the OSDF and Envirocare WAC will be containerized for off-site disposal.

## 1.2 BACKGROUND AND DESCRIPTION OF THE REMEDIATION AREA

The Perimeter Area covers approximately 13 acres of the southern portion of the FEMP. Figure 1-3 shows the following areas within the limits (or scope of work) of the A2PI NWU Perimeter Area:

- Basins 1, 2 and 4
- Turnaround
- Non-Impacted Material Stockpile (NIMS) No. 1
- Former running track
- Gravel roads surrounding NIMS No. 1
- SWU Site Preparation Ditches 1 through 8 and 14
- Equipment Wash Facility (EWF) – including ingress, egress, and adjacent Haul Road
- Grassy Knoll area
- Construction roads connecting Basin 2 and EWF
- SF excavation (stockpile material remaining from SWU excavation and Carolina Area remediation, remaining above-FRL material)
- All associated under- and above-ground utilities.

The primary scope of remediation activities within the Perimeter Areas is removal of the features installed during the SWU site preparation and excavation projects, debris, and any soil that is above FRL or contains flyash that had extended under those SWU Site Preparation features.

Predesign investigations have shown that radiological contamination is not the driver for remediation of the Perimeter Areas, although real-time scans and data from soil sampling and analysis have identified the presence of above-FRL material in several areas. These above-FRL areas, along with other impacted

materials, will be excavated during the remediation. Section 2.0 presents a complete discussion of the Perimeter Area's predesign investigations and findings.

## 1.3 SUMMARY OF REGULATORY DRIVERS

Regulatory requirements, criteria and legal obligations are the drivers for FEMP remediation activities, and Section 1.3.1 of the SEP provides the overall discussion on FEMP regulatory drivers. A summary of regulatory drivers applicable to the remediation of the Perimeter Area is presented in the following paragraphs.

### 1.3.1 ARARs and TBCs

The subset of applicable or relevant and appropriate requirements (ARARs) and to be considered criteria (TBC) that will guide remedial actions in the Perimeter Area are included in the Design Criteria Package for the A2PI SWUs Implementation Plan.

### 1.3.2 Permits

The National Pollutant Discharge Elimination System (NPDES) permit (Permit No.1IO00004*FD), for storm water and wastewater discharges to Paddys Run and the Great Miami River, covers the discharge of stormwater from the Perimeter Area during excavation through the implementation of the permit-required sitewide Storm Water Pollution Prevention Plan (SWPPP; Procedure PL-3083). Thus, no modifications to the permit are required as a result of the Perimeter Area remedial actions.

### 1.3.3 Natural Resource Trusteeship and Related Natural Resource Regulations

Two mechanisms drive protection of natural resources during remediation: the Natural Resource Trusteeship process and compliance with pertinent federal and state regulations. Both of these mechanisms have been incorporated into the Perimeter Area remedial design.

Regulatory drivers for the management of natural and cultural resources and associated surveys are grouped into three areas: threatened and endangered species protection, wetlands/floodplain protection, and the resolution of DOE's liability for injuries to natural resources.

1.3.3.1 Threatened and Endangered Species

Based on updated FEMP property surveys conducted in 1993 and 1994, DOE does not expect to encounter any federal- or state-listed threatened or endangered species or critical habitat in the areas to be addressed by the Perimeter Area remediation project. Therefore, no additional threatened or endangered species surveys are planned for the area.

1.3.3.2 Wetlands/Floodplains

Jurisdictional wetlands and waters of the United States that are identified on the FEMP property are delineated in the 1993 FEMP Wetland Delineation Report (COE 1993), officially approved by the U.S. Army Corps of Engineers (COE) on August 19, 1993. Based on the overlay of the Perimeter Area boundary on the 1993 FEMP Jurisdictional Wetland Delineation, no jurisdictional wetlands are located within the Perimeter Area.

A portion of the Perimeter Area is located within the 100-year floodplain of Paddys Run. The floodplain elevations of Paddys Run reach the western slope of the former IFP and the toe of the former SF slope, which covers the Basin 1/Turnaround portion of the Perimeter Area. Potential impacts will be minimized through the design and implementation of appropriate erosion and sedimentation controls. No long-term impacts or changes in the elevation of the 100-year flood in Paddys Run are anticipated as a result of the Perimeter Area remediation activities. The remediation activities are authorized by Nationwide Permit 38 (Cleanup of Hazardous and Toxic Waste) under 33 Code of Federal Regulations (CFR) 330.1(c).

1.3.3.3 Resolution of DOE's Liability for Injuries to Natural Resources

The Natural Resource Trustees (NRTs) are working to resolve liability that DOE faces for injuries to natural resources under CERCLA. In 1986, the State of Ohio filed a claim against the DOE for injuries to natural resources. The claim has been in stay while negotiations are proceeding toward resolution. The State of Ohio has designated the Ohio Environmental Protection Agency (OEPA) as their trustee representative in matters involving natural resource injuries. The Fernald NRTs have jointly developed the NRRP for the Fernald site, and have tentatively agreed that DOE, through implementation of the plan, will resolve natural resource liability at the Fernald site, including the 1986 State of Ohio claim.

### 1.3.4 Cultural Resource Management

DOE, the Ohio Historic Preservation Office (OHPO), and the Advisory Council on Historic Preservation (ACHP) have entered into a "Programmatic Agreement Regarding Archaeological Investigations at the Fernald Environmental Management Project" (March 6, 1997), pursuant to 36 CFR Part 800.13. Pursuant to the programmatic agreement, cultural resources are not anticipated within the NWUs, and no archaeological surveys are planned for the area. However, a contingency plan is in place to ensure that any cultural resources discovered during remediation activities are recognized and protected.

## 1.4 COMPONENTS OF THE REMEDY

The Perimeter Area remediation activities address specific components of the selected remedies set forth in the OU5 ROD for debris and environmental media, including soil. These activities are coordinated closely with OSDF construction [an OU2 ROD (DOE 1995c) remedy component], which is being conducted under another FEMP RA plan. The following is a summary of OU5 remedy components that are particularly relevant to this plan and an indication of specific actions that will be taken in the Perimeter Area:

- Establishment of OSDF WAC for the on-site disposal of OU5 materials. The OSDF WAC have been established and are discussed in detail in the Impacted Materials Placement Plan (IMPP; DOE 2000b) and the WAC Attainment Plan.

- Predesign Investigations were performed to augment historical data and refine excavation limits, as discussed in Section 2.0.

- Excavation to the depth established and shown on the construction drawings. Excavation will be performed in such a way as to minimize dilution of impacted material and keep exposure to humans as low as reasonably achievable (ALARA). Excavation includes removal of all soil with contaminant levels above FRLs.

- Transportation and on-site disposal of excavated material that meets the OSDF WAC. All impacted material excavated from the Perimeter Area will be transported to the OSDF for placement, provided the OSDF WAC is met; materials that do not meet the physical WAC of the OSDF will be size reduced as necessary prior to transport to the OSDF.

- Precertification and certification real-time scanning, sampling and analysis in the excavated areas to confirm material with COC levels above FRLs has been removed. As discussed in Section 7.2 of the SEP, a CDL will detail the proposed certification activities. If results of the certification sampling and analysis indicate that above-FRL contamination remains, supplemental excavation and certification sampling and analysis will be performed. The certification program is discussed in Section 3.4 of the SEP.

- Restoration following excavation and certification sampling and analysis. Restoration will include permanent seeding and coordination with Natural Resources. The extent of restoration will depend on the end use of the area and the appropriate habitat; the final land use will be included in the final version of the NRRP. The restoration schedule has not been determined at this time; this IRDP presents a conceptual restoration grading plan.

- Institutional controls such as access restrictions at the Perimeter Area project. During remediation, access will be restricted through the use of barriers and warning/caution signs. Long-term institutional controls necessary to implement restoration goals under the site's selected remedy are presented in the NRRP.

- Maintenance of the remediated area after restoration. Periodic checks will be made to assure that restoration efforts have been effective and are in place, such as adequate seeding and vegetative coverage over the remediated area.

## 1.5 LESSONS LEARNED

A lessons learned program has been implemented to apply knowledge accumulated during successive remedial efforts conducted under the SEP. Lessons learned from past remedial activities in Area 1 and Area 2 (A1PI, A1PII, A2PI SWUs, A2PI NWU Carolina Area, and A2PIII Part Two) have been incorporated into this IRDP to ensure that remedial activities carried out under this plan meet all applicable requirements and achieve the highest quality level possible. Some of the most important lessons include:

- Obtain regulatory approval on PSPs before beginning work

- Complete sampling and analysis activities before submitting IRDP (if possible), and include all data in the Implementation Plan

- If possible, determine the need to excavate surrounding soil material with debris through adequate predesign activities

- Perform walk-downs of project area to identify the presence of surface debris and remove debris prior to certification activities

- Excavate prohibited items in such a manner that they are transported to the appropriate stockpile location at the time of their removal from the excavation area

- Perform continuous visual observation of the excavation to identify and segregate special material.

Because the general complexity of remedial activities varies from area to area, soil remediation approaches at the FEMP will continue to evolve with each successive remedial effort.

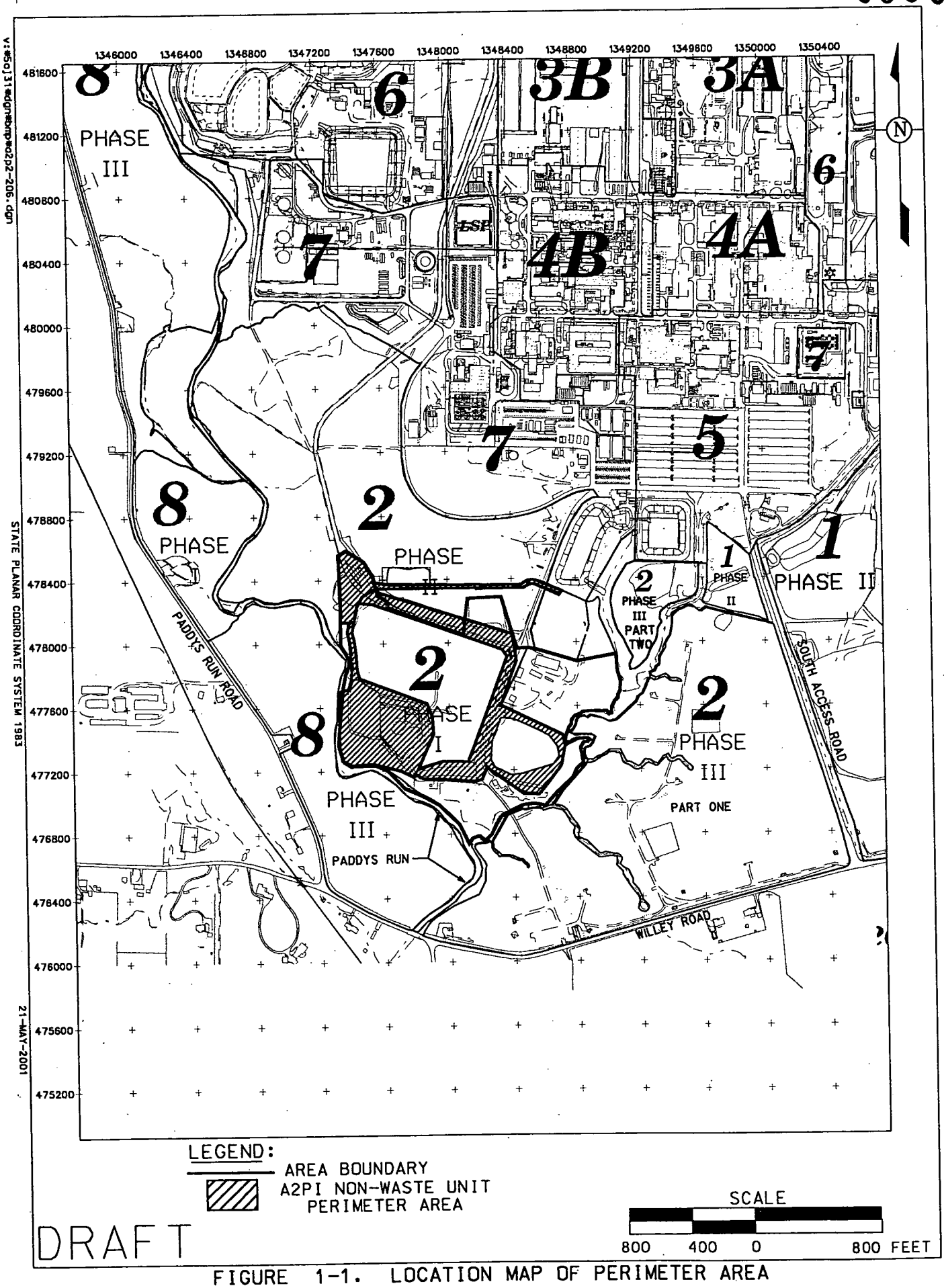



FIGURE 1-1. LOCATION MAP OF PERIMETER AREA

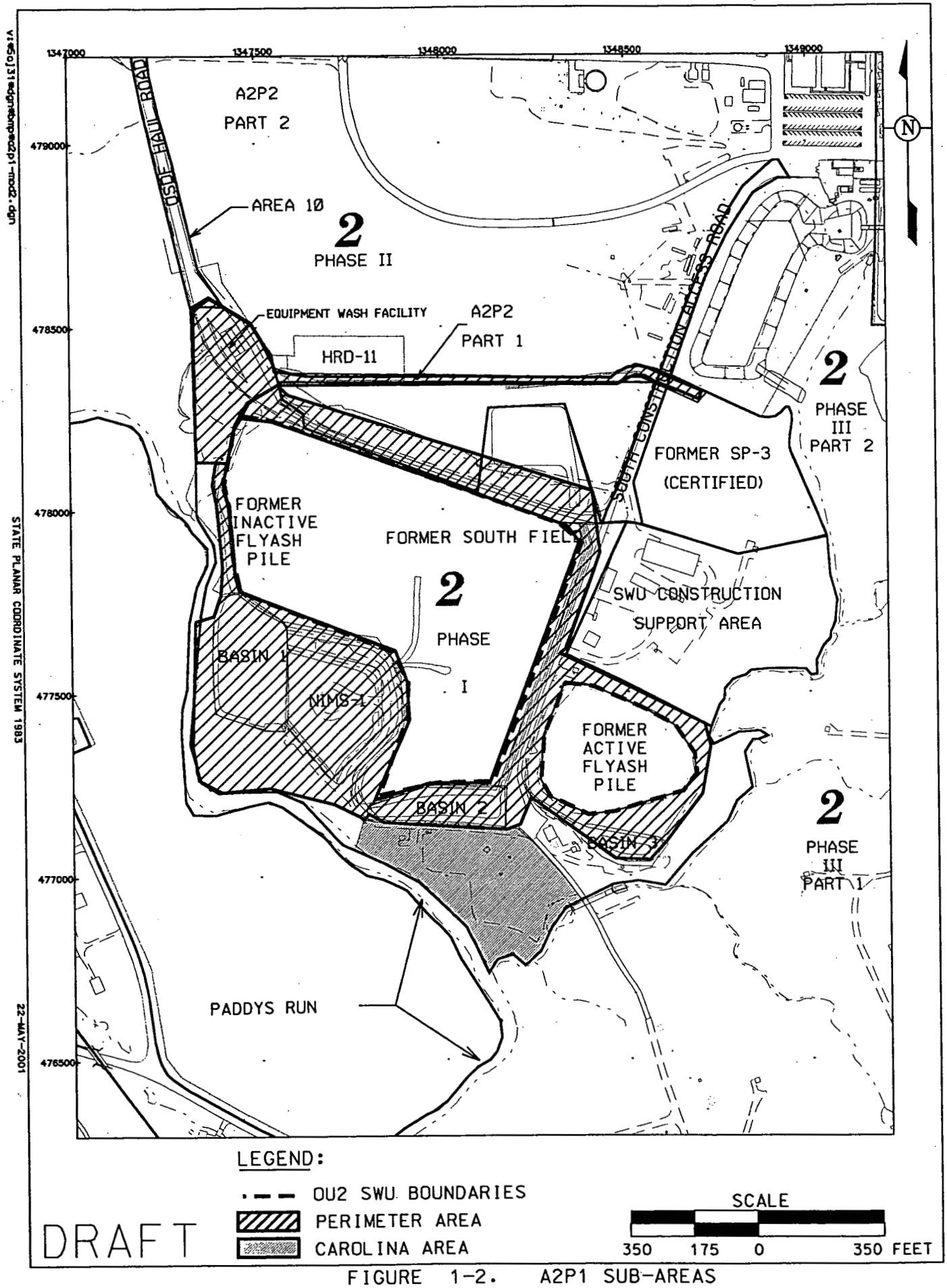
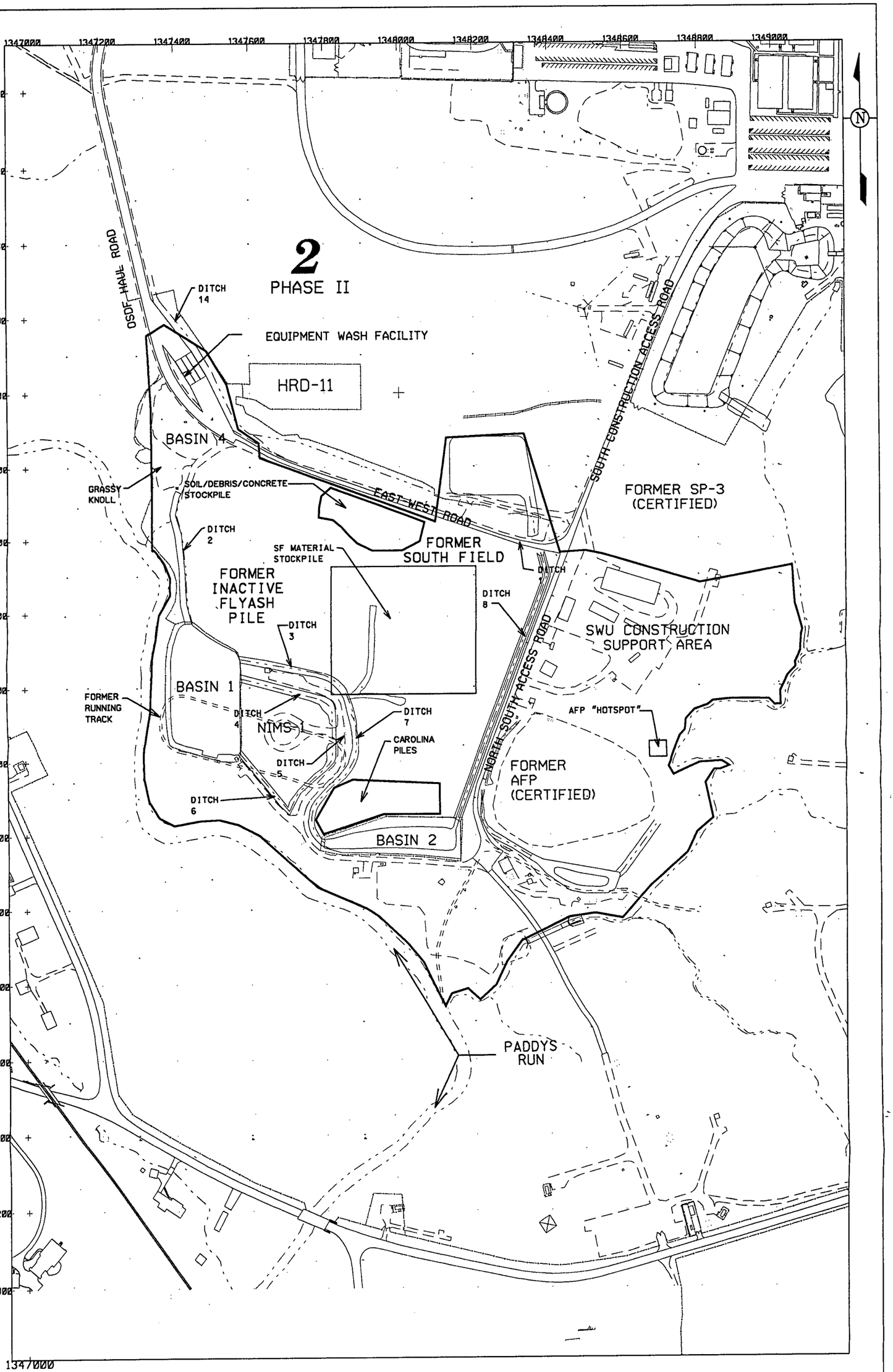



FIGURE 1-2. A2P1 SUB-AREAS




LEGEND:

A2PI BOUNDARY

SCALE

250 125 0 250 FEET

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FIGURE 1-3. A2PI NWU PERIMETER AREA FEATURES

# 2.0 PREDESIGN INVESTIGATIONS AND CHARACTERIZATION DATA

This section summarizes the investigations used in developing the remedial design for the Perimeter Area. These investigations include:

- Characterization Investigation Study conducted by Roy F. Weston Co.
- OU5 RI/FS activities
- A2PI NWU/Area 2, Phase II (A2PII) Part One Predesign Investigation (DOE 1999), which consisted of the following:
  - Physical sampling and analyses to delineate the extent of above-FRL contamination
  - Real-Time Gamma Spectroscopy measurements
  - Lithological examination of soil borings.

These investigations were used to identify the COCs for the A2PI NWUs, including the Perimeter Area, to describe the expected surface and subsurface conditions, as well as to present the anticipated excavation boundaries.

## 2.1 SUMMARY OF RI/FS AND PREDESIGN INVESTIGATIONS

Predesign investigations used to characterize the Perimeter Area include studies conducted as part of the OU5 RI/FS, as well as additional sampling and real-time gamma spectroscopy measurements that were completed pursuant to RI/FS activities under the PSP. In many remediation areas, data generated from RI activities are not comprehensive for the purpose of preparing detailed engineering designs and excavation drawings, and additional radiological surveys and sampling programs must be implemented to collect the needed data.

Real-time, field-deployable instruments such as the Radiation Tracking System (RTRAK), the Radiation Scanning System (RSS), and the high-purity germanium detector (HPGe), can satisfy a major portion of these additional data needs. These field-deployable instruments are integrated with discrete sampling and subsequent laboratory analysis to maintain an efficient remediation process.

### 2.1.1 RI/FS Data Review

The nature and extent of radiological constituents within the Perimeter Area are based on data collected during RI/FS field investigation activities. More detailed information regarding the extent and nature of contamination within the Perimeter Area is available in Section 4.0 of the OU5 RI Report. The development and list of FRLs pertinent to OU5 are presented in the OU5 ROD. Data queries were retrieved from the Sitewide Environmental Database (SED) to identify sample locations that exhibited contamination levels greater than the FRLs; all sample locations, except for one with above-FRL beryllium, showed below-FRL concentrations. Since the results for the one above-FRL sample were very close to the FRL, and the area will undergo extensive physical sampling during the certification process, this sample location was not investigated further.

### 2.1.2 A2PI NWU/A2PII Part One Predesign Investigation

Pursuant to the RI/FS, other investigative techniques were utilized in the Perimeter Area:

- Real-Time Gamma Spectroscopy measurements
- Physical sampling and analysis, including lithological examination of soil borings.

The purpose of these investigations is discussed in the following paragraphs; the real-time and analytical results of the investigations are presented in Appendix A of this Implementation Plan.

#### 2.1.2.1 Predesign Real-Time Scanning

Real-time instrumentation was used to scan the Perimeter Area for potential above-FRL contamination for total uranium, radium-226, or thorium-232. Maps showing the highest total uranium, thorium-232, radium-226, and total counts per second values collected by the RTRAK and RSS, and data tables of the HPGe measurement results, are included in Appendix A. As noted in these tables and figures, some of the real-time data were above the FRL, but below the certification "hot spot" criterion, particularly north of the East-West Construction Road.

#### 2.1.2.2 Predesign Soil Sampling

Soil was collected and analyzed, and/or lithologically described, at 28 sample locations. All of the sample results were below-FRL. However, five locations indicated the presence of flyash with depths ranging from 0.5 feet to 1.5 feet. Figure 2-1 illustrates the sample point locations. All analytical data are presented in Appendix A.

## 2.2 IDENTIFICATION OF EXCAVATION COCs

The selection process for retaining COCs for a remediation area is driven by applying a set of decision criteria. A soil contaminant will be retained as a COC for the Perimeter Area if the following are true:

- It is listed as a soil COC in the OU5 ROD
- It can be traced to site use, either through process knowledge or known release of the constituent to the environment
- Analytical results indicate the contaminant is present at a concentration above its FRL, and the above-FRL concentrations are not attributable to false positives or elevated Contract Required Detection Limits (CRDL)
- Physical characteristics of the contaminant, such as half-life, indicate it is likely to persist in the soil between time of release and remediation
- The contaminant is one of the sitewide primary COCs.

The selected remedy for OU5 discusses the full suite of on-site COCs as well as their corresponding FRLs. The SEP divides these sitewide COCs into two groups, primary and secondary. Total uranium, radium-226, radium-228, thorium-228, and thorium-232 are sitewide primary COCs and will be retained as area-specific constituents of concern (ASCOCs) for this reason. No above-FRL concentrations of any of the secondary COCs were detected in the Perimeter Area during predesign. Since no mechanism for other secondary COCs within the Perimeter Area can be identified, only the sitewide primary COCs will be retained as ASCOCs.

## 2.3 SUMMARY OF SURFACE AND SUBSURFACE CONDITIONS

Surface and subsurface conditions in the Perimeter Area are described in the following paragraphs in terms of surface coverage, drainage patterns, and at- and below-grade debris.

### 2.3.1 Surface Coverage and Drainage Pattern

The Perimeter Area covers approximately 13 acres. Much of the area is currently lined with geomembrane liner, which will be removed during remediation. The drainage of the area is primarily to the south, towards the existing Retention Basins 1, 2 and 4. There are some areas (roads, Grassy Knoll, former AFP "hot spot") which drain to either Paddys Run or the Storm Sewer Outfall Ditch (SSOD).

### 2.3.2 At- and Below-Grade Debris

Well House 13 has a concrete foundation with footers that are approximately 3 feet deep. This foundation will be excavated upon removal of the well house structure, along with the adjacent Site Preparation Ditch 3, the gravel road, and the former running track.

Some of the site preparation ditches, NIMS No. 1, and Retention Basins 1 and 2 are lined with geomembrane liner. Others contain dumped rock, erosion control matting, or both. This material will be removed and size reduced for placement in the OSDF.

A portion of the transfer line from Retention Basin 1 will be removed, as will a portion of the treatment line and discharge lines coming out of Well House 13. This pipe will be size reduced and transferred to the OSDF for placement; the associated appurtenances will be evaluated for possible reuse or dispositioned accordingly. Based on the debris that was encountered during the installation of these utilities, particularly the treatment and discharge lines, it is anticipated that additional debris and flyash will be encountered along the pipe trenches. This material will be transported to the OSDF for placement.

## 2.4 ANTICIPATED EXCAVATION BOUNDARIES

OU5 RI/FS data, predesign investigations, and visual identification were used to delineate the presence of impacted material and establish the extent of excavation within the Perimeter Area. Approximately 17,000 $yd^3$ of material will be excavated from the Perimeter Area and transported to the OSDF for placement. The excavation procedures to be used are discussed in Section 3.3.

## 2.5 SOUTH FIELD EXCAVATIONS

(Note: This section is presented for information only)

Based on the increased excavation depth found to be necessary during excavation of the former IFP, 14 soil borings were collected along the interface of the SF and the IFP to assess the OU2 FRL attainment at final grade. Some of the boring locations (SF-FG-1 through SF-FG-6, and SF-FG-13 and -14) were placed to assess potential contamination migration from the former IFP above-WAC area and the asbestos/debris area in the northwest corner of the SF. Sample intervals ranging from the surface to 24 feet at depth were analyzed for total uranium, with a few samples in the area of the former Firing Range also analyzed for total lead and arsenic. At three locations, SF-FG-2, SF-FG-13 and SF-FG-7,

at-depth sample intervals had total uranium concentrations above-FRL [10 parts per million (ppm)]. Bounding borings and intervals isolated the OU2 above-FRL total uranium concentrations to an approximate depth of 20 feet at the SF-FG-2/13 and 4 feet at the SF-FG-7 boring locations. Figure 2-2 illustrates the sample point locations and analytical data. These locations are being excavated concurrently with development of this IRDP.

Two areas within the SF were excavated based on these above-FRL sample results, one surrounding sample locations SF-FG-2 and -13, and another around SF-FG-7. The extent of excavation for these areas is presented in the construction drawings. An estimated 18,000 $yd^3$ will be excavated from these two excavation locations.

Stockpiles remaining within the former SWU footprint will also be hauled and transported to the OSDF for placement at the time of the Perimeter Area remediation. These include a soil/debris/concrete pile located in the northern portion of the former SF and the Carolina Stockpiles located in the southern portion of the former SF. These stockpiles, along with grading within the footprint of the stockpiles and some miscellaneous excavations within the area, will constitute approximately 12,000 $yd^3$ of material to be transported to the OSDF for disposal.

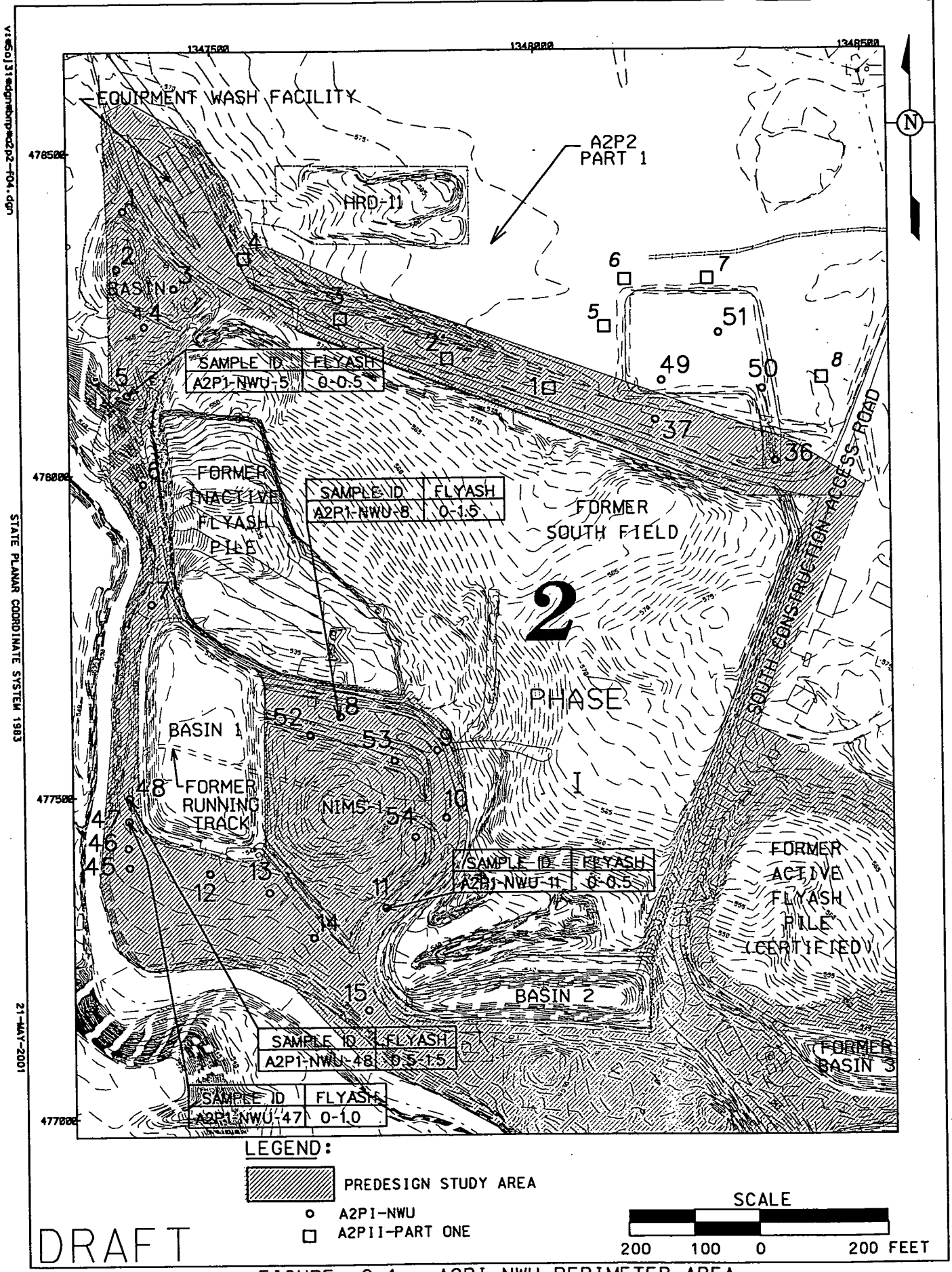
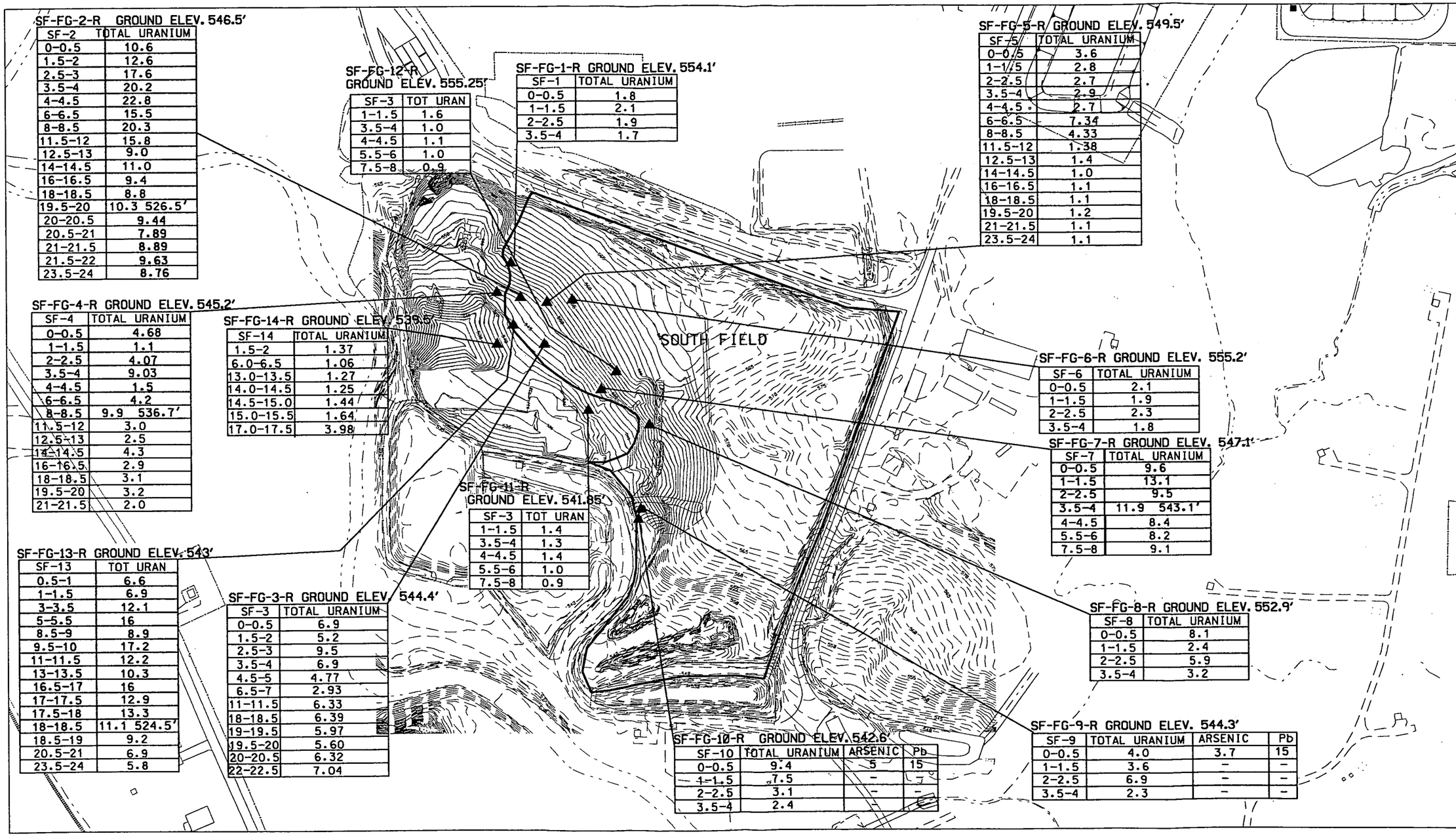



FIGURE 2-1. A2PI NWU PERIMETER AREA REMEDIATION PREDESIGN SOIL BORINGS




SF-FG-2-R GROUND ELEV. 546.5'

| SF-2 | TOTAL URANIUM |
|---|---|
| 0-0.5 | 10.6 |
| 1.5-2 | 12.6 |
| 2.5-3 | 17.6 |
| 3.5-4 | 20.2 |
| 4-4.5 | 22.8 |
| 6-6.5 | 15.5 |
| 8-8.5 | 20.3 |
| 11.5-12 | 15.8 |
| 12.5-13 | 9.0 |
| 14-14.5 | 11.0 |
| 16-16.5 | 9.4 |
| 18-18.5 | 8.8 |
| 19.5-20 | 10.3 526.5' |
| 20-20.5 | 9.44 |
| 20.5-21 | 7.89 |
| 21-21.5 | 8.89 |
| 21.5-22 | 9.63 |
| 23.5-24 | 8.76 |

SF-FG-12-R GROUND ELEV. 555.25'

| SF-3 | TOT URAN |
|---|---|
| 1-1.5 | 1.6 |
| 3.5-4 | 1.0 |
| 4-4.5 | 1.1 |
| 5.5-6 | 1.0 |
| 7.5-8 | 0.9 |

SF-FG-1-R GROUND ELEV. 554.1'

| SF-1 | TOTAL URANIUM |
|---|---|
| 0-0.5 | 1.8 |
| 1-1.5 | 2.1 |
| 2-2.5 | 1.9 |
| 3.5-4 | 1.7 |

SF-FG-5-R GROUND ELEV. 549.5'

| SF-5 | TOTAL URANIUM |
|---|---|
| 0-0.5 | 3.6 |
| 1-1.5 | 2.8 |
| 2-2.5 | 2.7 |
| 3.5-4 | 2.9 |
| 4-4.5 | 2.7 |
| 6-6.5 | 7.34 |
| 8-8.5 | 4.33 |
| 11.5-12 | 1.38 |
| 12.5-13 | 1.4 |
| 14-14.5 | 1.0 |
| 16-16.5 | 1.1 |
| 18-18.5 | 1.1 |
| 19.5-20 | 1.2 |
| 21-21.5 | 1.1 |
| 23.5-24 | 1.1 |

SF-FG-4-R GROUND ELEV. 545.2'

| SF-4 | TOTAL URANIUM |
|---|---|
| 0-0.5 | 4.68 |
| 1-1.5 | 1.1 |
| 2-2.5 | 4.07 |
| 3.5-4 | 9.03 |
| 4-4.5 | 1.5 |
| 6-6.5 | 4.2 |
| 8-8.5 | 9.9 536.7' |
| 11.5-12 | 3.0 |
| 12.5-13 | 2.5 |
| 14-14.5 | 4.3 |
| 16-16.5 | 2.9 |
| 18-18.5 | 3.1 |
| 19.5-20 | 3.2 |
| 21-21.5 | 2.0 |

SF-FG-14-R GROUND ELEV. 539.5'

| SF-14 | TOTAL URANIUM |
|---|---|
| 1.5-2 | 1.37 |
| 6.0-6.5 | 1.06 |
| 13.0-13.5 | 1.27 |
| 14.0-14.5 | 1.25 |
| 14.5-15.0 | 1.44 |
| 15.0-15.5 | 1.64 |
| 17.0-17.5 | 3.98 |

SF-FG-6-R GROUND ELEV. 555.2'

| SF-6 | TOTAL URANIUM |
|---|---|
| 0-0.5 | 2.1 |
| 1-1.5 | 1.9 |
| 2-2.5 | 2.3 |
| 3.5-4 | 1.8 |

SF-FG-7-R GROUND ELEV. 547.1'

| SF-7 | TOTAL URANIUM |
|---|---|
| 0-0.5 | 9.6 |
| 1-1.5 | 13.1 |
| 2-2.5 | 9.5 |
| 3.5-4 | 11.9 543.1' |
| 4-4.5 | 8.4 |
| 5.5-6 | 8.2 |
| 7.5-8 | 9.1 |

SF-FG-11-R GROUND ELEV. 541.85'

| SF-3 | TOT URAN |
|---|---|
| 1-1.5 | 1.4 |
| 3.5-4 | 1.3 |
| 4-4.5 | 1.4 |
| 5.5-6 | 1.0 |
| 7.5-8 | 0.9 |

SF-FG-13-R GROUND ELEV. 543'

| SF-13 | TOT URAN |
|---|---|
| 0.5-1 | 6.6 |
| 1-1.5 | 6.9 |
| 3-3.5 | 12.1 |
| 5-5.5 | 16 |
| 8.5-9 | 8.9 |
| 9.5-10 | 17.2 |
| 11-11.5 | 12.2 |
| 13-13.5 | 10.3 |
| 16.5-17 | 16 |
| 17-17.5 | 12.9 |
| 17.5-18 | 13.3 |
| 18-18.5 | 11.1 524.5' |
| 18.5-19 | 9.2 |
| 20.5-21 | 6.9 |
| 23.5-24 | 5.8 |

SF-FG-3-R GROUND ELEV. 544.4'

| SF-3 | TOTAL URANIUM |
|---|---|
| 0-0.5 | 6.9 |
| 1.5-2 | 5.2 |
| 2.5-3 | 9.5 |
| 3.5-4 | 6.9 |
| 4.5-5 | 4.77 |
| 6.5-7 | 2.93 |
| 11-11.5 | 6.33 |
| 18-18.5 | 6.39 |
| 19-19.5 | 5.97 |
| 19.5-20 | 5.60 |
| 20-20.5 | 6.32 |
| 22-22.5 | 7.04 |

SF-FG-8-R GROUND ELEV. 552.9'

| SF-8 | TOTAL URANIUM |
|---|---|
| 0-0.5 | 8.1 |
| 1-1.5 | 2.4 |
| 2-2.5 | 5.9 |
| 3.5-4 | 3.2 |

SF-FG-10-R GROUND ELEV. 542.6'

| SF-10 | TOTAL URANIUM | ARSENIC | Pb |
|---|---|---|---|
| 0-0.5 | 9.4 | 5 | 15 |
| 1-1.5 | 7.5 | - | - |
| 2-2.5 | 3.1 | - | - |
| 3.5-4 | 2.4 | | |

SF-FG-9-R GROUND ELEV. 544.3'

| SF-9 | TOTAL URANIUM | ARSENIC | Pb |
|---|---|---|---|
| 0-0.5 | 4.0 | 3.7 | 15 |
| 1-1.5 | 3.6 | - | - |
| 2-2.5 | 6.9 | - | - |
| 3.5-4 | 2.3 | - | - |

LEGEND:

EXCAVATION BOUNDARY

▲ SOUTHFIELD FRL SOIL BORINGS

000025

SCALE

200 100 0 200 FEET

DRAFT

v:\2fm12\dgn\bor_sf_tu2.dgn STATE PLANAR COORDINATE SYSTEM 1983 21-MAY-2001

FIGURE 2-2. A2PI SWU FRL SAMPLE LOCATIONS

# 3.0 REMEDIAL ACTION APPROACH

The general approach to Perimeter Area remediation is in accordance with "Excavation Approach A – Shallow Excavation of Impacted On-Property Area Outside the Former Production Area and other Waste Storage/Management Areas," described in Section 4.1 of the SEP. The performance requirements for implementing this approach are presented on the construction drawings and technical specifications for excavation activities included as part of the IRDP. The drawings and specifications will become part of either the design documents or a traveler package that will govern remediation activities. Specific methods and procedures to perform the work will be provided in the design documents.

In addition to this IRDP, a technical reference package will provide supplemental information and direction for the contractor(s). The technical reference package will include as-built Construction Drawings from the SWU Site Preparation and Excavation projects (projects 20401 and 20402).

A construction subcontractor, the FEMP labor contractor (Wise), or a combination of the two will perform the Perimeter Area remediation. Design documents will reflect the approach; drawings and specifications will apply to a subcontractor, whereas a traveler package will govern work by the FEMP labor contractor.

The Perimeter Area remedial actions will consist of removing identified impacted material, i.e., soil with flyash and stockpiles from previous remedial activities, and manmade features such as geomembrane liners, utilities, and roads. Remediation activities are scheduled to begin in Summer 2001.

## 3.1 ESTABLISHING SITE BOUNDARIES AND CONTROLS

The project boundary will be posted as a contamination area. Vehicle entry points will be defined and controlled by the contractor upon approval from Fluor Fernald, and all exiting vehicles will travel north on the construction road before entering the Impacted Material Haul Road via the SWUs. Access to the wells in A2PIII (south of the Perimeter Area) will be maintained through an entrance on Willey Road.

### 3.1.1 Control of Surface Water

Surface water will be controlled by the existing surface water management system. The contractor will use the existing surface water management facilities to support the excavation work for as long as

possible. This will include monitoring and maintaining the retention basins, ditches and other facilities while the features are in use. Excavation will be sequenced such that surface water management features will not be removed until all areas draining to that feature have been remediated. As necessary, active areas will be graded to drain to collection points located within the excavation and pumped to the nearest retention basin for transfer to the site's Storm Water Retention Basins for treatment.

## 3.2 SURVEYING AND SITE LAYOUT

Surveys will be used to identify the areas to be excavated, record the limits of work performed and features that are left in place for future removal (i.e., existing site utilities within the construction road limits). Surveys will be performed periodically throughout the project as measurements of progress, at intervals specified within the design documents.

### 3.2.1 Monitoring Well Abandonment/Protection

There are 19 monitoring wells and one extraction well within or adjacent to the Perimeter Area's boundaries which will require protection during excavation, as identified in Table 3-1 and on the construction drawings. It is the responsibility of the contractor to maintain integrity of these wells during any contractor activities. In the event that any of these wells are abandoned before the area is excavated, any remaining casings or concrete pads will be removed and dispositioned to the appropriate location (stockpile, OSDF, etc.).

## 3.3 AT- AND BELOW-GRADE STRUCTURE DEMOLITION

The housing of Well House 13, located just east of Retention Basin 1, will be dismantled and relocated for future use. The concrete slab and foundation will be removed and size reduced for disposal in the OSDF. All instrumentation from the building will be removed by the Aquifer Restoration Project prior to demolition of the building. The extraction well located within the well house structure will remain and require protection during excavation.

The EWF will be removed, including the water line to the EWF, the reinforced concrete pad and trenches, the automated wash system installed by a previous contractor, the oil/water separator, and the discharge line that runs to Retention Basin 4. The concrete pad will be size reduced for placement in the OSDF; the other components will be evaluated for future reuse and dispositioned accordingly.

## 3.4 EXCAVATION, MONITORING AND SEGREGATION

In addition to specific scope items discussed below, the contractor will be responsible primarily for:

- Excavating impacted material within A2PI NWU Perimeter Area
- Loading, hauling, and unloading impacted material that does not meet the OSDF WAC to temporary staging locations [i.e., SP-7 or another area designated by WPRAP, or a Special Materials Transfer Area (SMTA)] prior to off-site treatment and/or disposal
- Loading, hauling, and unloading impacted material that meets WAC in the OSDF or temporary staging area (OMTA soil staging area).

The limits of the design excavation were developed from the predesign data. Areas where impacted material was identified were delineated and identified for removal. All structures installed through either the SWU Site Preparation or Excavation contract will be removed in such a manner that the A2PI area will be ready for certification.

General excavation covers the following:

- Retention Basin 1 - removal of vegetation, sediment, geomembrane liner, sediment barriers, lift station and associated piping, and any visible impacted material (flyash) beneath the liner (within anchor trenches)
- Retention Basin 2 - removal of vegetation, sediment, geomembrane liner, sediment barriers, lift station and associated piping, chain link fence, and any visible impacted material beneath the liner (within anchor trenches)
- Retention Basin 4 - removal of sediment, pump, associated piping, above-ground piping, 6-inch scrape of footprint
- Turnaround - removal of gravel road and geotextile under gravel road (by others)
- NIMS No. 1 - removal of stockpile material (by others), remaining stockpile material (6-inch layer), underlying geotextile and geomembrane liner
- Former Running Track - 2 foot deep excavation under footprint of NIMS No. 1 to remove former running track soil and flyash
- Gravel Roads - removal of gravel roads leading to Basin 1 and surrounding NIMS No. 1; including removal of Well House 13 structure and associated above-ground piping
- SWU Site Preparation Ditches 1 through 8 and 14 - removal of sediment, geomembrane liner, dumped rock, underlying flyash and/or debris (if necessary), and scrape of ditch

- Equipment Wash Facility - removal of EWF piping, trenches, concrete pad, culverts, manhole, asphalt ingress, egress and curbs, and scrape of footprint

- Grassy Knoll Area - removal of surface soil/flyash in area, remove existing West Seepage Station and associated piping and utilities, remove existing piping from Basin 4 to West Seepage Station, remove existing line from catch basin near road to Paddys Run

- Construction Roads between Basin 2 and EWF (North-South and East-West roads) - 6-inch scrape of road surface (leaving utilities in place for future removal)

- AFP Hot Spot - removal of contamination found near the northeast corner of the former AFP, going down over the hill

- All identified under- and above-ground utilities.

Since RI/FS data indicate there are no organic COCs in the Perimeter Area that affect design or excavation or that exceed the OSDF WAC, only organic monitoring associated with health and safety requirements will be performed.

Fluor Fernald will provide a Health and Safety Representative and a Radiological Technician to be in the field or available full-time to monitor for occupational exposure to the workers. These professionals will use the tools that are available to them to monitor the excavation work area as necessary and appropriate, and may include real-time air monitoring equipment, full shift personal breathing zone air sampling for subsequent laboratory analysis, and radiological friskers. The information obtained by these personnel will be used to make decisions regarding personal protective equipment (PPE) and other worker-related issues. This information will also be available to Waste Generator Services and Waste Acceptance Organization (WAO) personnel and will be used to determine if additional monitoring and/or sampling are necessary to characterize the material for disposal purposes.

Appropriate measures will be implemented to control dust generation during excavation and transport. These measures include temporary seeding or application of a crusting agent in areas to be left idle for more than 45 days, and the use of water, dust suppressants, crusting agents, and other measures. Continuous visual observation for special materials, prohibited items or elevated contamination levels will be provided by WAO and radiological technicians, in addition to the contractor's workforce. If radiological monitoring or visually discolored materials are found during the excavation, indicating the

presence of elevated contamination, then the affected soil will be evaluated by WAO and the radiological technicians and then transported to the OSDF (or SP-7) for placement.

Approximately 2500 $yd^3$ of debris is anticipated during the remediation of the Perimeter Area, resulting from the removal of Category 2 material, miscellaneous debris, and dumped rock. Additional material such as piping, geotextile, and geomembrane will require size reducing prior to transport to the OSDF for placement. Any debris not passing OSDF WAC for visual inspection, but meeting Envirocare WAC, will be size reduced as necessary and managed at SP-7.

### 3.4.1 Retention Basins 1, 2 and 4

The remediation of the retention basins will take place once the areas draining to them are no longer considered impacted. The geomembrane liners, berms and anchor trenches of Basins 1 and 2 will be removed along with the sandbag sediment barriers, riser pipes and lift stations and dispositioned in the OSDF.

Basin 1

A portion of the northern berm of Basin 1 will be excavated as flyash is chased from the former IFP boundary. An area to the southwest of Basin 1 (sample locations A2PI-NWU-47 and -48) has also been identified as a portion of the former running track, and will be excavated to a depth of approximately 2 feet. This excavation to the southwest of Basin 1 may include a portion of the southern berm to ensure that all flyash and debris that was reported during the installation of Basin 1 has been removed. The clay infiltration barrier of Basin 1 will be left in place in an attempt to establish a low permeable soil suitable for wetland type of habitat during the restoration phase for the area.

Basin 2

The previous SWU excavation contractor left some impacted material in place at the southern boundary of the former SF due to the Basin 2 anchor trenches. A portion of the northern berm of Basin 2 may therefore be excavated as the remaining impacted material is removed. After the riser and geomembrane liner have been removed (including the anchor trenches), the Basin 2 footprint will be left as a depression, with any necessary excavation for FRL attainment and some grading into the topography of the former SF to the north.

In the A2PI SWUs Implementation Plan for OU2 (DOE 1998c), it was proposed that the soil from NIMS No. 1 would be used as backfill for Basin 2, since there is no clay infiltration barrier. At the time, it appeared to facilitate certification of the footprint under NIMS No. 1. However, Basin 2 cannot be removed before the roads and Site Preparation Ditch 8 are removed, and they are currently some of the last features that are to be excavated. Therefore, the material from NIMS No. 1 is being used for construction of the OSDF Cell 1 cap, and Basin 2 will be left as a depression.

Basin 4

Basin 4 will be removed after the EWF has been removed and the east-west construction road is removed and replaced by a new clean road. The pump assembly will be removed, and the above-ground transfer line will be size reduced; both will be evaluated for future re-use or dispositioned appropriately (either OSDF or SP-7). A 6-inch scrape of the basin footprint will be performed and the material taken to the OSDF for disposal and the basin slopes will then be recompacted. The overall topography in the area will remain as a depression.

### 3.4.2 Turnaround, NIMS No. 1 and Former Running Track

Before remediation of the Perimeter Area, the turnaround gravel and geotextile, and the soil from NIMS No. 1, will be excavated by another project for use of the OSDF Cell 1 cap construction. An approximate 6-inch layer of soil from NIMS No. 1 will be left in an effort to prevent mixing of the soil with any liner material. As part of this IRDP's scope, the remaining soil layer and the underlying geomembrane and geotextile liners will be removed, size reduced, and transported to the OSDF for placement. A portion of the soil will be used as backfill for the removed Basin 1 lift station.

NIMS No. 1 was constructed over a portion of the former running track; other portions of the track were excavated with the construction of Retention Basin 1 or remain to the southwest of Basin 1. Based on predesign sample results and the location of the former running track, the footprint of NIMS No. 1 will be excavated to a depth of approximately 2 feet, to include the portions of the former running track that remain in that area (including sample locations A2PI-NWU-8 and -11).

### 3.4.3 Well House 13 and Gravel Roads

Well House 13 is located to the east of Basin 1, just north of NIMS No. 1. Before Perimeter Area remediation activities, the instrumentation and pump from the well house will be removed by the Aquifer

Restoration Project. The remaining scope of the Well House 13 removal will be governed by this IRDP. The well house structure will be dismantled and stored for future re-use. The foundation will be removed, size reduced, and taken to the OSDF for disposition. There will be two monitoring wells and one extraction well left in place that will require protection during excavation in that area. Fluor Fernald will lower the wells as necessary after the excavation.

At the southeast corner of Basin 2, the construction road goes from paved to gravel, extending west to Basin 1 and to Well House 13. Between the beginning of the gravel road and the fork in the road at the western end of Basin 2, only a 6-inch scrape will be performed in order to protect existing utilities under the road that are to remain. Once the scrape has been performed, real-time monitoring will be performed to determine if contamination remains. If so, the location will be recorded on the project's as-built drawings for future excavation when the utilities are removed. A new clean gravel road will be established to maintain access to Well House 14. The two branches of the gravel road that extend to the Basin 1 lift station and to Well House 13 will be removed, including the subgrade, and dispositioned as impacted material.

### 3.4.4 SWU Site Preparation Ditches 1 through 8 and 14

The Site Preparation project installed numerous surface water and erosion control features, including ditches, as was shown in Figure 1-3. Many of these ditches were lined with either geomembrane liner or dumped rock, or in some cases, both. It was known at the time of installation that impacted material remained beneath the lining of the ditches, but was left in place to facilitate positive drainage in the ditches. These ditches will be removed.

#### Ditch 1

Ditch 1 runs along the northern boundaries of the former SF and IFP, and currently carries runoff from the east-west construction road into Basin 4. There is grown vegetation, but no synthetic liner in Ditch 1. This ditch will be repaired and maintained until the east-west construction road has been removed and a new, clean road has been established. At that time, Ditch 1 can be excavated and the runoff from the road can enter into the former SF and IFP. The ditch line will be scraped and the material transported to the OSDF for disposal.

Ditch 2

Ditch 2 is located on the western boundary of the former IFP, and was previously used to carry discharge from the EWF to Basin 1. Ditch 2 is divided into two sections; 2A is lined with dumped rock, 2B is lined with geomembrane liner. There is visible evidence of flyash under the liner in ditch 2; this flyash was not excavated with the former IFP because doing so would have undercut the ditch and interfered with the flow of water from the EWF to Basin 1. The discharge from the EWF is now retained in Basin 4, thereby allowing the remediation of Ditch 2. The dumped rock and geomembrane liner will be removed, size reduced as necessary, and transported to the OSDF for disposal. The flyash will then be chased to the west until completely removed, possibly to the eastern bank of Paddys Run. This chasing to the west will include remediation of the flyash at sample location A2PI-NWU-05.

Ditch 3

Ditch 3 is located along the southern boundary of the former IFP and discharges into Basin 1 at its western end. This ditch is lined with geomembrane liner. There is visible flyash extending from the former IFP under Ditch 3, and therefore the liner must be removed and the flyash chased to the south until completely removed. The chasing to the south will be incorporated with the excavation of the NIMS No. 1 footprint, including the flyash at sample location A2PI-NWU-08.

Ditches 4, 5 and 6

Ditches 4, 5, and 6 surround NIMS No. 1 and are lined with geomembrane. Ditch 5 flows into Ditch 4, which discharges into Basin 1 at its western end, and Ditch 6 discharges into Basin 2 via a culvert at its eastern end. The check dams, sediment and geomembrane liner from these ditches will be removed as part of the removal of NIMS No. 1. The excavation under the footprint of NIMS No. 1 will include the footprints of these ditches.

Ditch 7

Ditch 7 is located along the western boundary of the former SF, discharging into Basin 2. The ditch is lined with geomembrane liner. Debris was observed during the installation of the ditch, so excavation will be performed along the ditch line (minimum 6-inch scrape) to ensure that the debris has been removed. The ditch is adjacent to the discharge and treatment lines that are being removed, and the area will be graded into the surrounding topography to establish positive drainage.

The removal of Ditch 7 will be performed prior to the removal of Basin 2, which will result in the lowering of the effective depth and capacity of Basin 2. To counter this, a berm will be installed near the inlet of Ditch 7 to Basin 2. The berm will raise the side elevation of the basin in that area higher than the designed spillway allowing for the design capacity of Basin 2 to be maintained.

Ditch 8

Ditch 8 is located along the eastern boundary of the former SF, and discharges into Basin 2. The ditch is lined with dumped rock and erosion control matting, and collects runoff from the former SF, the north-south construction road, and a small portion of the east-west construction road. Once the roads have been removed and clean road established, then Ditch 8 can be removed. The dumped rock will be removed and the ditch line will be scraped a minimum 6-inches, with all material transported to the OSDF for disposal.

Ditch 14

Ditch 14 is located on the east side of the EWF, collecting runoff from A2PII from the north. The discharge from Ditch 14 runs to Paddys Run via a culvert beneath the east-west construction road to a catch basin and discharge pipe. This ditch is not lined, but does contain a vegetative cover. Due to a lack of predesign data, a 6-inch scrape of the ditch line will be obtained.

### 3.4.5 Equipment Wash Facility

The EWF was installed to support the remediation activities of A2PI. The Perimeter Area remediation brings this activity, and the need for the EWF, to a completion. The ingress, concrete wash pad and trenches, oil/water separator, and egress will be removed, along with the water lines leading to the EWF and the discharge lines that lead to Basin 4. The automatic wash system installed by the previous SWU contractor will be removed, along with all its appurtenances. The pavement and subgrades, along with the concrete, will be transported to the OSDF for disposal. The automated system will be evaluated for possible future re-use and dispositioned appropriately. Once the EWF has been removed, a minimum 6-inch scrape will be excavated from the footprint of the EWF, followed by real-time monitoring to ensure that no additional excavation is required. The resulting depression will be graded into the surrounding topography.

### 3.4.6 Grassy Knoll Area

The grassy knoll is located to the southwest of Basin 4. As-built drawings from previous projects, in conjunction with visual observation and predesign data, indicate the presence of a pocket of flyash in this area. An approximate 1-foot excavation will be performed over the area, and then any remaining flyash will be chased until all impacted material has been removed.

Located adjacent to the grassy knoll area is the manhole containing the West Seepage Station. This manhole will be removed, along with the pump and sediment that has filled the manhole. The dual containment pipe running from the manhole to the north will also be removed to the cleanout manhole located in the east-west construction road (the manhole and remaining line will be left in place for future use by others).

As discussed previously, the water that is collected from Ditch 14 discharges into a catch basin and then Paddys Run through an 18-inch corrugated HDPE pipe. The catch basin and the drainage pipe will be removed in conjunction with the West Seepage Station manhole and Ditch 2, due to their proximity. The area will be regraded and stabilized using bioengineering techniques to ensure positive drainage and slope stability.

### 3.4.7 Construction Roads

The paved construction roads run between Basin 2 and the EWF, consisting of the north-south road (between the former AFP and former SF) and the east-west road (running along the northern boundary of the former SF and former IFP to the EWF). Some utilities (site water, site gas, Seepage Station discharge lines) will remain within the limits of these roads, and therefore only a scrape of the road surface will be obtained at this time. The road surface will be removed to a total depth of approximately 6 inches. The existing four culverts and protective mound in the north-south road will be removed. Once the scrape of the roads has been performed, real-time monitoring will be performed to determine if contamination remains. If so, the location will be recorded on the project's as-built drawings for future excavation when the utilities are removed. If no additional contamination is found, this scan will be considered part of the precertification data, as described in the PSP for the A2PI Precertification Real-Time Scan (DOE 2000c). A clean gravel road surface will then be established in their place.

In addition, a 6-inch scrape will be performed in the grassy area north of the east-west construction road. This is due to the known runoff from the road into that area. Predesign real-time monitoring showed slightly elevated contaminant levels in this area that were beneath the "hot-spot" criteria, so the scrape is being performed as a precaution.

### 3.4.8 South Field and Stockpiles

(Note: This section provided for information only)

There are two areas within the former SF that have not met FRLs at the design elevation, and therefore must undergo additional excavation, as shown on Figure 3-1. The excavation around sample locations SF-FG-2 and -13 is approximately 20 feet in depth. The excavation around sample location SF-FG-7 will be approximately 4.5 feet deep. The material removed from these excavations will be stockpiled within the former SF and subsequently transported to the OSDF for disposal. The excavations will not be performed in lifts with real-time scanning based on physical sampling results, which have established that the OSDF WAC is being met in these areas, and the fact that the excavation is in an area of native soils, not waste material. Any changes to the 20-foot excavation will be submitted to the registered professional engineer for approval prior to implementation in the field.

There are several existing stockpiles remaining within the former SF; a soil/debris/concrete pile that will require some size reduction prior to placement in the OSDF, and the stockpiles containing material excavated from the Carolina Area in the Fall of 2000. The Carolina piles will be transported to the OSDF for placement, and a 6-inch scrape will be excavated from their footprint. The debris and oversized concrete from the soil/debris/concrete pile will be processed so that the material meets the OSDF physical WAC. Additional excavation to meet design grade in the former SF will take place within the soil/debris/concrete pile footprint upon removal of the pile.

### 3.4.9 Active Flyash Pile Hot Spot and Berm

During the Site Preparation phase, contamination was identified in a swale at the northeast corner of the former AFP. This material will be removed during the Perimeter Area remediation and transported to the OSDF for placement. The swale slope will be stabilized following excavation.

The berm that was installed along the western boundary of the former AFP, to prevent runoff from the road from entering into the certified former AFP footprint, will be removed once the north-south construction road has been scraped and a new clean surface reestablished.

### 3.4.10 Utilities

Both above- and below-ground utilities will be removed during the Perimeter Area remediation. The transfer line section from Basin 1 will be removed, as will the portions of the treatment line and discharge line from Well House 13. These three lines will be cut at a location where they are all in a common trench, and then plugged and capped (as shown on construction drawings). The drinking water line installed for the EWF will be removed. The portion of the dual containment line from the West Seepage Station will be removed between the pump manhole and the clean-out Manhole 1, located southeast of the EWF; the remaining portion will remain in place for re-use by the Aquifer Restoration Project. A portion of the wastewater line that carried discharge from the EWF to the West Seepage Station was removed during the installation of Basin 4; the remaining portion will be removed during this remediation.

The electric will be disconnected at Well House 14 (south of Basin 2), eliminating power to Basin 1 and Well House 13. Electric will also be disconnected at the EWF, since power will no longer be needed at the EWF or Basin 4. These removals will include the removal of the overhead cables and hardware, as well as the poles. The poles and associated hardware that are removed during remediation will be stored for future re-use by others. The existing poles and overhead electric lines that provide service to the EWF will remain in place for use by the Aquifer Restoration Project.

## 3.5 IMPACTED MATERIAL MANAGEMENT

### 3.5.1 Excavation of Below-WAC Material

The combination of visual monitoring and radiological survey monitoring will ensure that special materials and above-WAC gamma-emitting contamination are identified. Visual monitoring by Fluor Fernald will take place during excavation to identify special materials. If special materials are identified, they will be handled in accordance with Section 3.5.4. Excavation lift scanning with real-time monitoring will not be needed.

At some time after completion of the excavation, the entire area will be precertified to ensure FRLs have been attained. As necessary, additional material will be excavated until the real-time monitoring indicates that FRLs have been attained. The area will then be ready for certification.

### 3.5.2 Excavation of Debris

Debris is expected and will be removed from portions of the Perimeter Area. Any material exceeding the OSDF physical WAC will be excavated, size reduced as necessary and subsequently hauled to the OSDF for disposal. Processing of debris will occur with appropriate controls based on the processing method and area/material conditions. Debris that meets the OSDF physical WAC will be excavated with the surrounding soil and soil-like material and dispositioned to the OSDF.

### 3.5.3 Excavation of Above-WAC Material

No above-WAC material is anticipated during the excavation of the Perimeter Area. Contingencies are in place, however, in the event that above-WAC material is encountered.

If isolated materials are identified as above-WAC material through radiological frisking, they will be excavated and transported to SP-7. The surrounding soils will then be evaluated through additional radiological frisking and possibly real-time monitoring to determine if additional above-WAC material is present.

Material that does not meet the chemical or radiological WAC of the OSDF will be transported to SP-7 or a SMTA and stored for off-site disposition at a later date.

### 3.5.4 Excavation of Special Materials

Section 3.3.2.2 of the SEP identifies special materials that, when encountered, require WAO input before the contractor can determine their disposition. Special materials include:

- Asbestos
- Drums and tanks
- Piping and pumps
- Process residues
- Uranium metal
- Miscellaneous debris
- Acid brick.

Some of these materials (asbestos, piping, and debris) may be placed in the OSDF if they meet the WAC and pass a visual inspection. Materials that do not meet the OSDF WAC will be placed at SP-7 or packaged into containers and staged within the project area until transferred to Fluor Fernald Waste Generator Services, with the exception of friable asbestos and uranium metal; these will be containerized and staged within the Perimeter Area project. Fluor Fernald Waste Generator Services will pick up the containers from the area for characterization of the material and eventual shipment to an off-site disposal facility. Information on the identification, management, and tracking of these materials is provided in the SEP (Section 3.6 and Appendix F).

## 3.6 EXCAVATION SEQUENCE

The remedial action excavation will be performed in a phased manner consistent with the concepts presented in the SEP.

Based on the criteria presented above, contracting and funding requirements, and expected funding levels, the excavation period is anticipated to extend through at least two construction years. The scope of the initial phase of work is scheduled for Summer 2001. The remaining scope will be performed in subsequent years (anticipated to begin in FY 2004), as funding becomes available.

The initial scope of work (Part One) will include: excavation of above-FRL material in the former SF; the removal of the existing stockpiles within the former SWUs; excavation of material under the soil/debris/concrete stockpile that remained from the SWU excavation design; excavation of the flyash in the Grassy Knoll area; removal of West Seepage Station and associated utilities, Ditch 2, NIMS No. 1 and underlying footprint (including Ditches 4-6); removing Well House 13; removing a portion of the transfer line, treatment and discharge lines; removing Ditches 3 and 7; removing gravel roads surrounding NIMS No. 1; removal of Retention Basin 1; and interim restoration grading of area with breakthrough to Paddys Run. The materials will be excavated and transported to the OSDF, with size reduction as necessary.

The excavations within the former SWUs and the Grassy Knoll area are included in this Implementation Plan for information only. Approval for this scope of work, which encompasses the completion of the SWU excavation and chasing of flyash material, was addressed through the A2PI SWUs IRDP.

The sequence for the remaining scope of work (Part 2), which involves Basins 2 and 4, the EWF, surrounding roads, Ditch 8, AFP hot spot and berm has not been clearly defined at this time due to the undetermined schedule for that work to take place. However, there are several fundamental sequencing rules that will govern the final work, regardless of when it takes place.

- Erosion and sediment control features must be established before excavation
- Retention Basin 2 - cannot be removed until the ditches that drain to it (Ditches 7 and 8) have been removed and until the north-south construction road and the gravel road south of Basin 2 have been removed and replaced by new, clean roads
- Retention Basin 4 - cannot be removed until the east-west construction road has been removed and replaced by a new, clean road, and until Ditch 1 and the EWF have been removed
- General - features such as ditches, basins, and roads must be removed in a logical sequential manner, such that they are removed only after other features that drain to them have been removed (i.e., roads removed before adjacent ditches, basins removed after contributing ditches, etc.)

In all cases, if special material or unexpected cultural resources are encountered, the excavation will move as necessary to another location a safe distance from the non-excavation activities associated with these conditions.

## 3.7 PRECERTIFICATION AND CERTIFICATION

Precertification activities will begin after the identified impacted materials have been removed and the excavation locations have been graded into the surrounding area. After precertification activities are completed, certification samples will be collected. The approach for certification will be presented under a separate CDL. Final grading and vegetation requirements for the slopes will be addressed in the NRRP.

The clean roads that are established as part of the Perimeter Area remediation are not permanent roads, as there are existing utilities that will remain for future use and future removal. Precertification and certification activities for these corridors will be conducted following the removal of the utilities at a later date.

Precertification will be performed on the clay infiltration barrier of Basin 1 or the underlying sand layer. If precertification indicates that contaminant levels in the infiltration barrier are above-FRL, it will be

removed and precertification and certification will be performed on the sand layer below. If precertification indicates that contaminant levels in the clay are below the FRLs, only the clay layer will be certified.

The schedule for precertification and certification for the former SWUs and the Perimeter Area remain to be established pending site funding and scheduling issues.

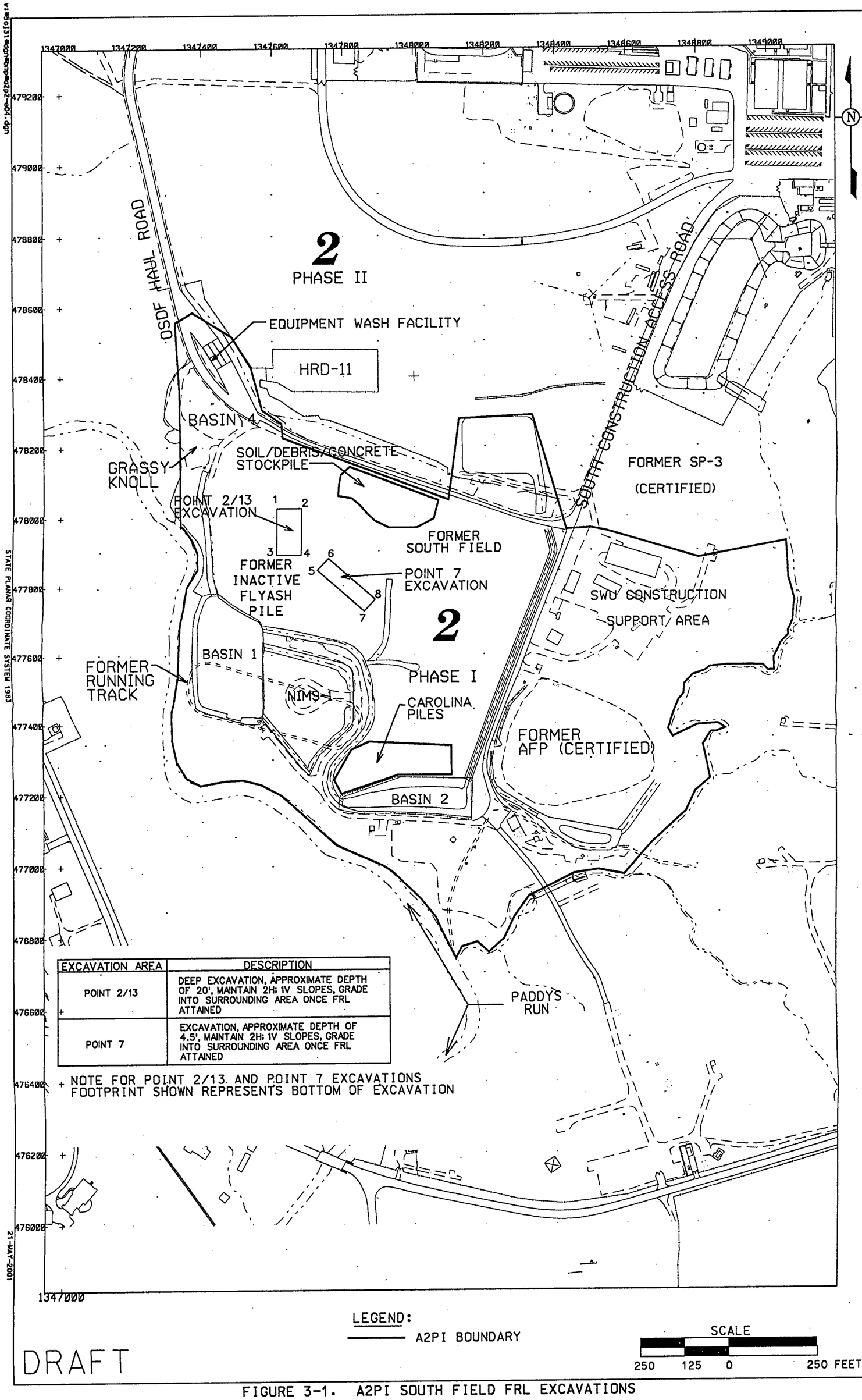
## 3.8 INTERIM RESTORATION

Interim restoration will be performed following the remediation of Part One of the Perimeter Area, and is presented in the Construction Drawings. The plan for interim restoration includes excavation of the existing channel protection in Paddys Run at the southwest corner of the former IFP to an approximate elevation of 533 feet. The riprap will be removed for the excavation, and the re-used in the same area to again establish channel protection. This grading will allow for overflow of Paddys Run into the area during storm events. Southwest of Retention Basin 2, the bank of Paddys Run will be excavated to an approximate elevation of 531 feet. Riprap remaining from the restoration work southwest of the former IFP will also be used in this area for additional channel stabilization.

A conceptual plan for restoration following the remediation of Part Two of the Perimeter Area has not been established at this time, and therefore will be presented at a later date. Final restoration for the area will be presented as part of the NRRP.

**TABLE 3-1**
**MONITORING WELLS IN A2PI NWU PERIMETER AREA**

| Monitoring Well | Status |
|---|---|
| 1045 | Active |
| 1048 | Active |
| 2016 | Active |
| 2045 | Active |
| 2046 | Active |
| 2048 | Active |
| 2385 | Active |
| 2402 | Active |
| 3045 | Active |
| 3046 | Active |
| 3385 | Active |
| 3402 | Active |
| 4016 | Active |
| 11032 | Active |
| 11085 | Active |
| 11128 | Active |
| 11129 | Active |
| 11234 | Active |
| 21033 | Active |
| 31565 | Active (extraction well) |




| EXCAVATION AREA | DESCRIPTION |
|---|---|
| POINT 2/13 | DEEP EXCAVATION, APPROXIMATE DEPTH OF 20', MAINTAIN 2H: 1V SLOPES, GRADE INTO SURROUNDING AREA ONCE FRL ATTAINED |
| POINT 7 | EXCAVATION, APPROXIMATE DEPTH OF 4.5', MAINTAIN 2H: 1V SLOPES, GRADE INTO SURROUNDING AREA ONCE FRL ATTAINED |

+ NOTE FOR POINT 2/13 AND POINT 7 EXCAVATIONS FOOTPRINT SHOWN REPRESENTS BOTTOM OF EXCAVATION

FIGURE 3-1. A2PI SOUTH FIELD FRL EXCAVATIONS

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# APPENDIX A

# REAL-TIME AND ANALYTICAL DATA

## APPENDIX A
## HPGe MEASURMENT RESULTS FOR A2P1 NWU PERIMETER AREA

| LOCATION ID | NORTHING | EASTING | DETECTOR HEIGHT | RADIUM-226 (pCi/g) | THORIUM-232 (pCi/g) | TOTAL URANIUM (ppm) |
|---|---|---|---|---|---|---|
| A2P1-NWU-1-G | 477326.60 | 1347538.10 | 100cm | 0.89 | 0.746 | 10.7 |
| A2P1-NWU-2-G | 477334.30 | 1347491.70 | 100cm | 0.988 | 0.697 | 10.9 |
| A2P1-NWU-3-G | 477321.20 | 1347474.80 | 100cm | 0.984 | 0.619 | 0.0433 |
| A2P1-NWU-4-G | 477345.20 | 1347472.20 | 100cm | 1.164 | 0.763 | 10.9 |
| A2P1-NWU-5-G | 477375.50 | 1347467.60 | 100cm | 1.231 | 0.715 | 9.15 |
| A2P1-NWU-6-G | 477384.10 | 1347443.80 | 100cm | 1.212 | 0.722 | 9.97 |
| A2P1-NWU-7-G | 477347.60 | 1347431.40 | 100cm | 1.325 | 0.645 | 8.45 |
| A2P1-NWU-8-G | 477311.90 | 1347431.50 | 100cm | 1.157 | 0.626 | 5.58 |
| A2P1-NWU-9-G | 477339.40 | 1347416.60 | 100cm | 1.129 | 0.636 | 12.5 |
| A2P1-NWU-10-G | 477306.70 | 1347395.00 | 100cm | 1.095 | 0.648 | 7.05 |
| A2P1-NWU-11-G | 477346.00 | 1347377.60 | 100cm | 1.174 | 0.611 | 0.0463 |
| A2P1-NWU-12-G | 477330.00 | 1347512.23 | 100cm | 0.912 | 0.764 | 8.9 |
| A2P1-NWU-13-G | 477352.64 | 1347449.58 | 100cm | 1.033 | 0.586 | 11.8 |
| A2P1-NWU-14-G | 477307.17 | 1347455.34 | 100cm | 1.074 | 0.601 | 8.42 |
| A2P1-NWU-15-G | 477327.72 | 1347386.63 | 100cm | 0.945 | 0.65 | 0.0435 |
| A2P1-NWU-16-G | 477594.93 | 1347366.23 | 100cm | 1.442 | 1.3 | 12.9 |
| A2P1-NWU-17-G | 477558.11 | 1347365.17 | 100cm | 0.952 | 0.674 | 0.0586 |
| A2P1-NWU-18-G | 477521.06 | 1347357.84 | 100cm | 1.803 | 1 | 8.22 |
| A2P1-NWU-19-G | 477487.49 | 1347313.50 | 100cm | 1.769 | 1.05 | 9.23 |
| A2P1-NWU-20-G | 477452.49 | 1347350.66 | 100cm | 1.116 | 0.659 | 18.2 |
| A2P1-NWU-21-G | 477415.00 | 1347341.62 | 100cm | 0.919 | 0.622 | 11.7 |
| A2P1-NWU-21-G-D | 477415.00 | 1347341.62 | 100cm | 0.955 | 0.614 | 13.1 |
| A2P1-NWU-22-G | 477382.67 | 1347338.80 | 100cm | 1.04 | 0.558 | 14.1 |
| A2P1-NWU-23-G | 477345.91 | 1377340.98 | 100cm | 0.827 | 0.484 | 8.27 |
| A2P1-NWU-24-G | 477095.73 | 1347958.00 | 100cm | 0.981 | 0.492 | 8.41 |
| A2P1-NWU-25-G | 477092.54 | 1347991.06 | 100cm | 1.115 | 0.646 | 17.5 |
| A2P1-NWU-26-G | 477092.32 | 1348025.09 | 100cm | 1.059 | 0.78 | 11.2 |
| A2P1-NWU-27-G | 477089.46 | 1348043.90 | 100cm | 1.045 | 0.71 | 10.2 |
| A2P1-NWU-29-G | 477066.62 | 1347974.49 | 100cm | 1.102 | 0.581 | 13.6 |
| A2P1-NWU-30-G | 477068.98 | 1347945.56 | 100cm | 1.07 | 0.499 | 6.62 |
| A2P1-NWU-31-G | 477064.26 | 1348007.77 | 100cm | 1.1 | 0.775 | 13.9 |
| A2P1-NWU-32-G | 477068.37 | 1348044.22 | 100cm | 0.885 | 0.796 | 12.3 |
| A2P1-NWU-33-G | 477034.00 | 1348025.26 | 100cm | 1.074 | 0.849 | 14.6 |



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## APPENDIX A
## HPGe MEASURMENT RESULTS FOR A2P1 NWU PERIMETER AREA

| LOCATION ID | NORTHING | EASTING | DETECTOR HEIGHT | RADIUM-226 (pCi/g) | THORIUM-232 (pCi/g) | TOTAL URANIUM (ppm) |
|---|---|---|---|---|---|---|
| A2P1-NWU-33-G-D | 477034.00 | 1348025.26 | 100cm | 1.022 | 0.805 | 14.1 |
| A2P1-NWU-34-G | 477029.47 | 1348058.56 | 100cm | 0.86 | 0.698 | 9.07 |
| A2P1-NWU-35-G | 477033.37 | 1347993.51 | 100cm | 1.095 | 0.764 | 12.9 |
| A2P1-NWU-36-G | 477034.52 | 1347957.16 | 100cm | 0.871 | 0.639 | 10.6 |
| A2P1-NWU-37-G | 477041.43 | 1347921.94 | 100cm | 0.828 | 0.635 | 9.94 |
| A2P1-NWU-38-G | 477039.85 | 1347891.85 | 100cm | 0.793 | 0.597 | 9.74 |
| A2P1-NWU-39-G | 477011.22 | 1347937.54 | 100cm | 0.894 | 0.589 | 0.0594 |
| A2P1-NWU-40-G | 477007.66 | 1347966.24 | 100cm | 0.857 | 0.528 | 9.1 |
| A2P1-NWU-41-G | 477000.66 | 1348003.57 | 100cm | 0.894 | 0.567 | 8.37 |
| A2P1-NWU-42-G | 476996.72 | 1348038.70 | 100cm | 1 | 0.597 | 11.6 |
| A2P1-NWU-43-G | 476970.19 | 1347980.42 | 100cm | 1.351 | 0.672 | 8.16 |
| A2P1-NWU-44-G | 476971.47 | 1348018.04 | 100cm | 1.151 | 0.44 | 7.73 |
| A2P1-NWU-45-G | 476966.06 | 1348055.95 | 100cm | 1.145 | 0.646 | 6.77 |
| A2P1-NWU-46-G | 476936.42 | 1348031.57 | 100cm | 1.441 | 0.561 | 6.8 |
| A2P1-NWU-47-G | 476953.45 | 1348003.87 | 100cm | 1.355 | 0.557 | 6.56 |
| A2P1-NWU-50-G | 476936.14 | 1348070.47 | 100cm | 0.969 | 0.673 | 11.7 |
| A2P1-NWU-51-G | 476905.23 | 1348052.32 | 100cm | 0.804 | 0.694 | 8.81 |
| A2P1-NWU-52-G | 476908.54 | 1348080.71 | 100cm | 1.03 | 0.713 | 8.5 |
| A2P1-NWU-53-G | 476873.33 | 1348077.95 | 100cm | 0.807 | 0.602 | 10.3 |
| A2P1-NWU-54-G | 476804.25 | 1348087.90 | 100cm | 1.539 | 0.612 | 7.23 |
| A2P1-NWU-55-G | 476778.10 | 1348107.77 | 100cm | 1.026 | 0.778 | 9.65 |
| A2P1-NWU-57-G | 476922.67 | 1348133.23 | 100cm | 0.656 | 0.642 | 8.64 |
| A2P1-NWU-58-G | 476899.21 | 1348158.97 | 100cm | 0.756 | 0.728 | 9.61 |
| A2P1-NWU-59-G | 476878.64 | 1348185.73 | 100cm | 0.716 | 0.762 | 14.1 |
| A2P1-NWU-60-G | 476857.95 | 1348210.48 | 100cm | 0.866 | 0.917 | 20.2 |
| A2P1-NWU-61-G | 476833.75 | 1348238.55 | 100cm | 0.749 | 0.688 | 12.8 |
| A2P1-NWU-61-G-D | 476833.75 | 1348238.55 | 100cm | 0.674 | 0.646 | 12.6 |
| A2P1-NWU-62-G | 476815.49 | 1348261.04 | 100cm | 1.096 | 0.917 | 15.3 |
| A2P1-NWU-63-G | 476849.02 | 1348269.33 | 100cm | 0.887 | 0.53 | 8.92 |
| A2P1-NWU-64-G | 476873.06 | 1348249.50 | 100cm | 0.913 | 0.469 | 9.3 |
| A2P1-NWU-65-G | 476801.85 | 1348235.41 | 100cm | 1.507 | 1.14 | 23.9 |
| A2P1-NWU-66-G | 476818.23 | 1348204.39 | 100cm | 0.725 | 0.823 | 14.1 |
| A2P1-NWU-67-G | 476845.16 | 1348177.39 | 100cm | 0.668 | 0.741 | 11.2 |



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## APPENDIX A
## HPGe MEASURMENT RESULTS FOR A2P1 NWU PERIMETER AREA

| LOCATION ID | NORTHING | EASTING | DETECTOR HEIGHT | RADIUM-226 (pCi/g) | THORIUM-232 (pCi/g) | TOTAL URANIUM (ppm) |
|---|---|---|---|---|---|---|
| A2P1-NWU-68-G | 476863.77 | 1348152.56 | 100cm | 0.682 | 0.714 | 14.8 |
| A2P1-NWU-69-G | 476880.45 | 1348125.69 | 100cm | 0.903 | 0.601 | 0.0469 |
| A2P1-NWU-70-G | 476899.99 | 1348097.03 | 100cm | 0.727 | 0.511 | 5.67 |
| A2P1-NWU-71-G | 476843.15 | 1348120.15 | 100cm | 0.715 | 0.604 | 0.0166 |
| A2P1-NWU-72-G | 476824.67 | 1348147.37 | 100cm | 0.669 | 0.693 | 0.0125 |
| A2P1-NWU-73-G | 476807.68 | 1348173.20 | 100cm | 0.771 | 0.696 | 7.4 |
| A2P1-NWU-74-G | 476783.09 | 1348206.20 | 100cm | 1.31 | 0.922 | 14.7 |
| A2P1-NWU-75-G | 476765.87 | 1348203.17 | 100cm | 1.021 | 0.787 | 10.9 |
| A2P1-NWU-76-G | 476807.65 | 1348117.83 | 100cm | 0.919 | 0.661 | 6.03 |
| A2P1-NWU-77-G | 476795.00 | 1348140.54 | 100cm | 0.616 | 0.607 | 10.4 |
| A2P1-NWU-77-G-D | 476795.00 | 1348140.54 | 100cm | 0.7 | 0.59 | 10.1 |
| A2P1-NWU-78-G | 476985.72 | 1348226.02 | 100cm | 0.839 | 0.633 | 15.6 |
| A2P1-NWU-79-G | 477047.10 | 1348231.41 | 100cm | 0.909 | 0.554 | 18.9 |
| A2P1-NWU-80-G | 477024.15 | 1348252.93 | 100cm | 1.028 | 0.713 | 13.2 |
| A2P1-NWU-81-G | 476993.35 | 1348273.27 | 100cm | 0.955 | 0.797 | 14.7 |
| A2P1-NWU-82-G | 476966.48 | 1348289.24 | 100cm | 1.393 | 0.739 | 11.7 |
| A2P1-NWU-84-G | 476942.80 | 1348266.68 | 100cm | 0.972 | 0.668 | 13.2 |
| A2P1-NWU-85-G | 477007.97 | 1348205.41 | 100cm | 0.757 | 0.515 | 13.7 |
| A2P1-NWU-109-G | 477107.00 | 1348043.00 | 100cm | 1.012 | 0.548 | 7.33 |
| A2P1-NWU-110-G | 477107.00 | 1348079.00 | 100cm | 1.024 | 0.55 | 0.0693 |
| A2P1-NWU-111-G | 477107.00 | 1348115.00 | 100cm | 0.882 | 0.44 | 0.0632 |
| A2P1-NWU-112-G | 477107.00 | 1348151.00 | 100cm | 0.911 | 0.372 | 5.41 |
| A2P1-NWU-112-G-D | 477107.00 | 1348151.00 | 100cm | 0.808 | 0.403 | 6.77 |
| A2P1-NWU-113-G | 477107.00 | 1348187.00 | 100cm | 1.018 | 0.48 | 8.04 |
| A2P1-NWU-114-G | 477107.00 | 1348223.00 | 100cm | 1.028 | 0.404 | 0.0221 |
| A2P1-NWU-119-G | 478146.16 | 1348162.39 | 100cm | 1.291 | 0.759 | 8.1 |
| A2P1-NWU-120-G | 478255.14 | 1348301.22 | 100cm | 1.784 | 0.99 | 12.7 |
| A2P1-NWU-121-G | 478258.04 | 1348283.52 | 100cm | 1.79 | 1.05 | 17.4 |
| A2P1-NWU-122-G | 478176.12 | 1348312.54 | 100cm | 1.331 | 0.873 | 0 |
| A2P1-NWU-123-G | 478155.79 | 1348324.85 | 100cm | 1.645 | 1.02 | 7.74 |
| A2P1-NWU-124-G | 478136.30 | 1348334.51 | 100cm | 1.674 | 1.01 | 13 |
| A2P2-PT1-1-G | 478125.41 | 1348439.18 | 100cm | 1.298 | 0.882 | 14.6 |
| A2P2-PT1-2-G | 478150.26 | 1348439.02 | 100cm | 1.304 | 0.829 | 14.2 |



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## APPENDIX A
## HPGe MEASURMENT RESULTS FOR A2P1 NWU PERIMETER AREA

| LOCATION ID | NORTHING | EASTING | DETECTOR HEIGHT | RADIUM-226 (pCi/g) | THORIUM-232 (pCi/g) | TOTAL URANIUM (ppm) |
|---|---|---|---|---|---|---|
| A2P2-PT1-3-G | 478182.65 | 1348447.81 | 100cm | 1.303 | 0.815 | 11.3 |
| A2P2-PT1-4-G | 478179.70 | 1348429.20 | 100cm | 1.314 | 0.866 | 15.9 |
| A2P2-PT1-05-G | 478221.19 | 1348428.97 | 100cm | 1.046 | 0.664 | 14.9 |
| A2P2-PT1-06-G | 478215.73 | 1348461.99 | 100cm | 0.876 | 0.655 | 9.66 |
| A2P2-PT1-7-G | 478248.41 | 1348456.06 | 100cm | 0.928 | 0.671 | 15.7 |
| A2P2-PT1-08-G | 478238.15 | 1348485.21 | 100cm | 1.12 | 0.683 | 0.0606 |
| A2P2-PT1-9-G | 478253.86 | 1348421.39 | 100cm | 1.007 | 0.7 | 18 |
| A2P2-PT1-10-G | 478156.88 | 1348086.28 | 100cm | 1.318 | 0.866 | 16.1 |
| A2P2-PT1-11-G | 478172.98 | 1348054.52 | 100cm | 1.424 | 0.892 | 14.6 |
| A2P2-PT1-12-G | 478187.82 | 1348020.18 | 100cm | 1.136 | 0.907 | 16.9 |
| A2P2-PT1-13-G | 478199.36 | 1347988.33 | 100cm | 1.259 | 0.91 | 17.7 |
| A2P2-PT1-14-G | 478215.50 | 1347954.01 | 100cm | 0.96 | 0.905 | 15.9 |
| A2P2-PT1-15-G | 478226.95 | 1347921.30 | 100cm | 1.254 | 0.956 | 16.8 |
| A2P2-PT1-16-G | 478232.48 | 1347888.75 | 100cm | 1.23 | 0.937 | 18.7 |
| A2P2-PT1-17-G | 478248.37 | 1347854.43 | 100cm | 0.914 | 0.884 | 14.2 |
| A2P2-PT1-18-G | 478270.07 | 1347823.42 | 100cm | 1.156 | 0.902 | 17.7 |
| A2P2-PT1-19-G | 478282.62 | 1347788.98 | 100cm | 1.284 | 0.953 | 15.5 |
| A2P2-PT1-20-G | 478296.58 | 1347755.30 | 100cm | 1.369 | 0.932 | 14.2 |
| A2P2-PT1-21-G | 478309.36 | 1347722.26 | 100cm | 0.943 | 0.778 | 12.1 |
| A2P2-PT1-22-G | 478309.62 | 1347663.04 | 100cm | 1.433 | 1.01 | 14.9 |
| A2P2-PT1-23-G | 478345.74 | 1347629.85 | 100cm | 1.301 | 0.879 | 15.6 |
| A2P2-PT1-24-G | 478296.48 | 1347695.53 | 100cm | 1.594 | 0.911 | 11.1 |
| A2P2-PT1-25-G | 478336.48 | 1347655.03 | 100cm | 1.558 | 0.885 | 18.4 |
| A2P2-PT1-26-G | 478190.12 | 1348085.92 | 100cm | 1.795 | 0.847 | 18.5 |
| A2P2-PT1-27-G | 478208.87 | 1348049.76 | 100cm | 2.027 | 0.891 | 19 |
| A2P2-PT1-28-G | 478228.25 | 1348017.43 | 100cm | 1.737 | 0.856 | 15.6 |
| A2P2-PT1-28-G-D | 478228.25 | 1348017.43 | 100cm | 1.685 | 0.852 | 15.4 |
| A2P2-PT1-29-G | 478240.13 | 1347983.56 | 100cm | 1.616 | 0.916 | 20.9 |
| A2P2-PT1-29-G-D | 478240.13 | 1347983.56 | 100cm | 1.72 | 0.893 | 17.3 |
| A2P2-PT1-30-G | 478253.94 | 1347945.78 | 100cm | 1.424 | 0.806 | 17.7 |
| A2P2-PT1-31-G | 478271.50 | 1347916.86 | 100cm | 1.549 | 0.935 | 7.53 |
| A2P2-PT1-32-G | 478275.45 | 1347883.61 | 100cm | 1.699 | 0.969 | 18.8 |
| A2P2-PT1-33-G | 478290.71 | 1347849.79 | 100cm | 1.395 | 0.899 | 15.4 |



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## APPENDIX A
## HPGe MEASURMENT RESULTS FOR A2P1 NWU PERIMETER AREA

| LOCATION ID | NORTHING | EASTING | DETECTOR HEIGHT | RADIUM-226 (pCi/g) | THORIUM-232 (pCi/g) | TOTAL URANIUM (ppm) |
|---|---|---|---|---|---|---|
| A2P2-PT1-34-G | 478301.85 | 1347816.77 | 100cm | 1.663 | 0.849 | 18 |
| A2P2-PT1-35-G | 478316.80 | 1347783.05 | 100cm | 1.86 | 0.964 | 17.1 |
| A2P2-PT1-36-G | 478329.98 | 1347749.12 | 100cm | 1.457 | 0.849 | 15.9 |
| A2P2-PT1-37-G | 478342.95 | 1347716.25 | 100cm | 1.588 | 0.884 | 15.2 |
| A2P2-PT1-38-G | 478355.74 | 1347679.82 | 100cm | 1.757 | 0.873 | 15.6 |
| A2P2-PT1-39-G | 478357.75 | 1347616.47 | 100cm | 1.757 | 0.898 | 17.2 |
| A2P2-PT1-40-G | 478366.89 | 1347601.80 | 100cm | 1.846 | 0.936 | 23.1 |
| A2P2-PT1-41-G | 478388.82 | 1347584.00 | 100cm | 1.97 | 0.969 | 20.9 |
| A2P2-PT1-42-G | 478348.39 | 1347778.96 | 100cm | 1.883 | 1.02 | 15.9 |
| A2P2-PT1-43-G | 478337.87 | 1347810.95 | 100cm | 1.681 | 1.02 | 17.3 |
| A2P2-PT1-44-G | 478326.39 | 1347844.03 | 100cm | 1.633 | 1.02 | 18.5 |
| A2P2-PT1-45-G | 478310.76 | 1347879.30 | 100cm | 1.477 | 0.96 | 18.3 |
| A2P2-PT1-46-G | 478297.19 | 1347912.30 | 100cm | 1.33 | 0.917 | 18 |
| A2P2-PT1-47-G | 478285.33 | 1347944.40 | 100cm | 1.455 | 0.902 | 20.8 |
| A2P2-PT1-48-G | 478274.89 | 1347978.87 | 100cm | 1.666 | 0.859 | 19.8 |
| A2P2-PT1-49-G | 478262.71 | 1348013.16 | 100cm | 1.112 | 0.691 | 16.9 |
| A2P2-PT1-50-G | 478247.87 | 1348046.85 | 100cm | 1.042 | 0.731 | 19.9 |
| A2P2-PT1-51-G | 478234.86 | 1348079.97 | 100cm | 0.887 | 0.687 | 18.3 |
| A2P2-PT1-52-G | 478271.08 | 1348074.28 | 100cm | 0.548 | 0.395 | 11.5 |
| A2P2-PT1-53-G | 478284.15 | 1348040.66 | 100cm | 0.978 | 0.689 | 20.5 |
| A2P2-PT1-55-G | 478297.60 | 1348006.95 | 100cm | 1.051 | 0.703 | 14.8 |
| A2P2-PT1-56-G | 478312.04 | 1347973.31 | 100cm | 0.947 | 0.686 | 17.4 |
| A2P2-PT1-57-G | 478325.92 | 1347940.54 | 100cm | 1.019 | 0.717 | 18.6 |
| A2P2-PT1-58-G | 478335.76 | 1347906.30 | 100cm | 0.873 | 0.736 | 14.6 |
| A2P2-PT1-59-G | 478333.84 | 1348001.78 | 100cm | 0.951 | 0.764 | 19.9 |
| A2P2-PT1-60-G | 478319.78 | 1348035.24 | 100cm | 0.913 | 0.717 | 19.6 |
| A2P2-PT1-61-G | 478307.42 | 1348068.44 | 100cm | 0.967 | 0.72 | 20.4 |
| A2P2-PT1-62-G | 478293.11 | 1348102.05 | 100cm | 0.986 | 0.781 | 15.4 |
| A2P2-PT1-63-G | 478329.41 | 1348093.37 | 100cm | 1.041 | 0.708 | 17.7 |
| A2P2-PT1-64-G | 478316.30 | 1348130.04 | 100cm | 0.935 | 0.695 | 19.6 |
| A2P2-PT1-65-G | 478316.40 | 1348166.23 | 100cm | 0.898 | 0.752 | 18.7 |
| A2P2-PT1-66-G | 478316.36 | 1348166.26 | 100cm | 1.081 | 0.698 | 20.1 |
| A2P2-PT1-66-G | 478316.28 | 1348202.20 | 100cm | 0.95 | 0.734 | 20 |



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## APPENDIX A
## HPGe MEASURMENT RESULTS FOR A2P1 NWU PERIMETER AREA

| LOCATION ID | NORTHING | EASTING | DETECTOR HEIGHT | RADIUM-226 (pCi/g) | THORIUM-232 (pCi/g) | TOTAL URANIUM (ppm) |
|---|---|---|---|---|---|---|
| A2P2-PT1-67-G | 478317.28 | 1348237.87 | 100cm | 1.073 | 0.778 | 18.6 |
| A2P2-PT1-68-G | 478317.06 | 1348273.62 | 100cm | 0.878 | 0.7 | 15.9 |
| A2P2-PT1-68-G-D | 478317.06 | 1348273.62 | 100cm | 0.949 | 0.706 | 15.5 |
| A2P2-PT1-69-G | 478316.96 | 1348309.86 | 100cm | 1.003 | 0.666 | 13 |
| A2P2-PT1-69-G-D | 478316.96 | 1348309.86 | 100cm | 1.011 | 0.633 | 14.8 |



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## APPENIDX A
## A2P1 PERIMETER AREA ANALYTICAL RESULTS

| BORING ID | SAMPLE ID | TOP DEPTH | BOTTOM DEPTH | PARAMETER | RESULT | QUALIFIER | UNITS |
|---|---|---|---|---|---|---|---|
| A2P1-NWU-1 | A2P1-NWU-1-1-R | 0 | 1 | Radium-226 | 0.975 | - | PCI/G |
| A2P1-NWU-1 | A2P1-NWU-1-1-R | 0 | 1 | Radium-228 | 0.756 | - | PCI/G |
| A2P1-NWU-1 | A2P1-NWU-1-1-R | 0 | 1 | Thorium-228 | 0.751 | - | PCI/G |
| A2P1-NWU-1 | A2P1-NWU-1-1-R | 0 | 1 | Thorium-232 | 0.756 | - | PCI/G |
| A2P1-NWU-1 | A2P1-NWU-1-1-R | 0 | 1 | Uranium, Total | 42.733 | - | MG/KG |
| A2P1-NWU-2 | A2P1-NWU-2-1-R | 0 | 1 | Radium-226 | 0.981 | - | PCI/G |
| A2P1-NWU-2 | A2P1-NWU-2-1-R | 0 | 1 | Radium-228 | 0.683 | - | PCI/G |
| A2P1-NWU-2 | A2P1-NWU-2-1-R | 0 | 1 | Thorium-228 | 0.686 | - | PCI/G |
| A2P1-NWU-2 | A2P1-NWU-2-1-R | 0 | 1 | Thorium-232 | 0.683 | - | PCI/G |
| A2P1-NWU-2 | A2P1-NWU-2-1-R | 0 | 1 | Uranium, Total | 4.277 | J | MG/KG |
| A2P1-NWU-3 | A2P1-NWU-3-1-R | 0 | 1 | Radium-226 | 1.263 | - | PCI/G |
| A2P1-NWU-3 | A2P1-NWU-3-1-R | 0 | 1 | Radium-228 | 0.928 | - | PCI/G |
| A2P1-NWU-3 | A2P1-NWU-3-1-R | 0 | 1 | Thorium-228 | 0.925 | - | PCI/G |
| A2P1-NWU-3 | A2P1-NWU-3-1-R | 0 | 1 | Thorium-232 | 0.928 | - | PCI/G |
| A2P1-NWU-3 | A2P1-NWU-3-1-R | 0 | 1 | Uranium, Total | 6.846 | - | MG/KG |
| A2P1-NWU-4 | A2P1-NWU-4-1-R | 0 | 1 | Radium-226 | 0.946 | - | PCI/G |
| A2P1-NWU-4 | A2P1-NWU-4-1-R | 0 | 1 | Radium-228 | 0.686 | - | PCI/G |
| A2P1-NWU-4 | A2P1-NWU-4-1-R | 0 | 1 | Thorium-228 | 0.672 | - | PCI/G |
| A2P1-NWU-4 | A2P1-NWU-4-1-R | 0 | 1 | Thorium-232 | 0.686 | - | PCI/G |
| A2P1-NWU-4 | A2P1-NWU-4-1-R | 0 | 1 | Uranium, Total | 4.29 | - | MG/KG |
| A2P1-NWU-5 | A2P1-NWU-5-2-R | 1 | 2 | Radium-226 | 1.154 | - | PCI/G |
| A2P1-NWU-5 | A2P1-NWU-5-2-R | 1 | 2 | Radium-228 | 0.837 | - | PCI/G |
| A2P1-NWU-5 | A2P1-NWU-5-2-R | 1 | 2 | Thorium-228 | 0.798 | - | PCI/G |
| A2P1-NWU-5 | A2P1-NWU-5-2-R | 1 | 2 | Thorium-232 | 0.837 | - | PCI/G |
| A2P1-NWU-5 | A2P1-NWU-5-2-R | 1 | 2 | Uranium, Total | 2.72 | U | MG/KG |
| A2P1-NWU-6 | A2P1-NWU-6-1-R | 0 | 1 | Radium-226 | 0.938 | - | PCI/G |
| A2P1-NWU-6 | A2P1-NWU-6-1-R | 0 | 1 | Radium-228 | 0.641 | - | PCI/G |
| A2P1-NWU-6 | A2P1-NWU-6-1-R | 0 | 1 | Thorium-228 | 0.608 | - | PCI/G |
| A2P1-NWU-6 | A2P1-NWU-6-1-R | 0 | 1 | Thorium-232 | 0.641 | - | PCI/G |
| A2P1-NWU-6 | A2P1-NWU-6-1-R | 0 | 1 | Uranium, Total | 4.489 | - | MG/KG |
| A2P1-NWU-7 | A2P1-NWU-7-1-R | 0 | 1 | Radium-226 | 0.803 | - | PCI/G |
| A2P1-NWU-7 | A2P1-NWU-7-1-R | 0 | 1 | Radium-228 | 0.605 | - | PCI/G |



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## APPENIDX A
## A2P1 PERIMETER AREA ANALYTICAL RESULTS

| BORING ID | SAMPLE ID | TOP DEPTH | BOTTOM DEPTH | PARAMETER | RESULT | QUALIFIER | UNITS |
|---|---|---|---|---|---|---|---|
| A2P1-NWU-7 | A2P1-NWU-7-1-R | 0 | 1 | Thorium-228 | 0.595 | - | PCI/G |
| A2P1-NWU-7 | A2P1-NWU-7-1-R | 0 | 1 | Thorium-232 | 0.605 | - | PCI/G |
| A2P1-NWU-7 | A2P1-NWU-7-1-R | 0 | 1 | Uranium, Total | 3.088 | J | MG/KG |
| A2P1-NWU-36 | A2P1-NWU-36-1-R | 0 | 1 | Radium-226 | 1.5 | NV | PCI/G |
| A2P1-NWU-36 | A2P1-NWU-36-1-R | 0 | 1 | Radium-228 | 0.99 | NV | PCI/G |
| A2P1-NWU-36 | A2P1-NWU-36-1-R | 0 | 1 | Thorium-228 | 0.99 | NV | PCI/G |
| A2P1-NWU-36 | A2P1-NWU-36-1-R | 0 | 1 | Thorium-232 | 0.99 | NV | PCI/G |
| A2P1-NWU-36 | A2P1-NWU-36-1-R | 0 | 1 | Uranium, Total | 8.2 | NV | MG/KG |
| A2P1-NWU-37 | A2P1-NWU-37-1-R | 0 | 1 | Radium-226 | 1.3 | NV | PCI/G |
| A2P1-NWU-37 | A2P1-NWU-37-1-R | 0 | 1 | Radium-228 | 0.99 | NV | PCI/G |
| A2P1-NWU-37 | A2P1-NWU-37-1-R | 0 | 1 | Thorium-228 | 0.98 | NV | PCI/G |
| A2P1-NWU-37 | A2P1-NWU-37-1-R | 0 | 1 | Thorium-232 | 0.99 | NV | PCI/G |
| A2P1-NWU-37 | A2P1-NWU-37-1-R | 0 | 1 | Uranium, Total | 16 | NV | MG/KG |
| A2P1-NWU-49 | A2P1-NWU-49-1-R | 0 | 1 | Radium-226 | 1.5 | NV | PCI/G |
| A2P1-NWU-49 | A2P1-NWU-49-1-R | 0 | 1 | Radium-228 | 1.1 | NV | PCI/G |
| A2P1-NWU-49 | A2P1-NWU-49-1-R | 0 | 1 | Thorium-228 | 1.1 | NV | PCI/G |
| A2P1-NWU-49 | A2P1-NWU-49-1-R | 0 | 1 | Thorium-232 | 1.1 | NV | PCI/G |
| A2P1-NWU-49 | A2P1-NWU-49-1-R | 0 | 1 | Uranium, Total | 5.4 | NV | MG/KG |
| A2P1-NWU-50 | A2P1-NWU-50-1-R | 0 | 1 | Radium-226 | 1.6 | NV | PCI/G |
| A2P1-NWU-50 | A2P1-NWU-50-1-R | 0 | 1 | Radium-228 | 1.2 | NV | PCI/G |
| A2P1-NWU-50 | A2P1-NWU-50-1-R | 0 | 1 | Thorium-228 | 1.2 | NV | PCI/G |
| A2P1-NWU-50 | A2P1-NWU-50-1-R | 0 | 1 | Thorium-232 | 1.2 | NV | PCI/G |
| A2P1-NWU-50 | A2P1-NWU-50-1-R | 0 | 1 | Uranium, Total | 3.2 | UNV | MG/KG |
| A2P1-NWU-51 | A2P1-NWU-51-1-R | 0 | 1 | Radium-226 | 1.6 | NV | PCI/G |
| A2P1-NWU-51 | A2P1-NWU-51-1-R | 0 | 1 | Radium-228 | 1.3 | NV | PCI/G |
| A2P1-NWU-51 | A2P1-NWU-51-1-R | 0 | 1 | Thorium-228 | 1.3 | NV | PCI/G |
| A2P1-NWU-51 | A2P1-NWU-51-1-R | 0 | 1 | Thorium-232 | 1.3 | NV | PCI/G |
| A2P1-NWU-51 | A2P1-NWU-51-1-R | 0 | 1 | Uranium, Total | 3.4 | NV | MG/KG |
| A2P1-NWU-52 | A2P1-NWU-52-10-R | 4.5 | 5 | Radium-226 | 0.909 | - | PCI/G |
| A2P1-NWU-52 | A2P1-NWU-52-3-R | 1 | 1.5 | Radium-226 | 1.202 | - | PCI/G |
| A2P1-NWU-52 | A2P1-NWU-52-10-R | 4.5 | 5 | Radium-228 | 0.565 | - | PCI/G |
| A2P1-NWU-52 | A2P1-NWU-52-3-R | 1 | 1.5 | Radium-228 | 0.909 | - | PCI/G |

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APPENIDX A
A2P1 PERIMETER AREA ANALYTICAL RESULTS

| BORING ID | SAMPLE ID | TOP DEPTH | BOTTOM DEPTH | PARAMETER | RESULT | QUALIFIER | UNITS |
|---|---|---|---|---|---|---|---|
| A2P1-NWU-52 | A2P1-NWU-52-10-R | 4.5 | 5 | Thorium-228 | 0.553 | - | PCI/G |
| A2P1-NWU-52 | A2P1-NWU-52-3-R | 1 | 1.5 | Thorium-228 | 0.906 | - | PCI/G |
| A2P1-NWU-52 | A2P1-NWU-52-10-R | 4.5 | 5 | Thorium-232 | 0.565 | - | PCI/G |
| A2P1-NWU-52 | A2P1-NWU-52-3-R | 1 | 1.5 | Thorium-232 | 0.909 | - | PCI/G |
| A2P1-NWU-52 | A2P1-NWU-52-10-R | 4.5 | 5 | Uranium, Total | 2.962 | J | MG/KG |
| A2P1-NWU-52 | A2P1-NWU-52-3-R | 1 | 1.5 | Uranium, Total | 2.627 | U | MG/KG |
| A2P1-NWU-53 | A2P1-NWU-53-10-R | 4.5 | 5 | Radium-226 | 1.406 | - | PCI/G |
| A2P1-NWU-53 | A2P1-NWU-53-3-R | 1 | 1.5 | Radium-226 | 1.365 | - | PCI/G |
| A2P1-NWU-53 | A2P1-NWU-53-10-R | 4.5 | 5 | Radium-228 | 0.9 | - | PCI/G |
| A2P1-NWU-53 | A2P1-NWU-53-3-R | 1 | 1.5 | Radium-228 | 0.952 | - | PCI/G |
| A2P1-NWU-53 | A2P1-NWU-53-10-R | 4.5 | 5 | Thorium-228 | 0.897 | - | PCI/G |
| A2P1-NWU-53 | A2P1-NWU-53-3-R | 1 | 1.5 | Thorium-228 | 0.951 | - | PCI/G |
| A2P1-NWU-53 | A2P1-NWU-53-10-R | 4.5 | 5 | Thorium-232 | 0.9 | - | PCI/G |
| A2P1-NWU-53 | A2P1-NWU-53-3-R | 1 | 1.5 | Thorium-232 | 0.952 | - | PCI/G |
| A2P1-NWU-53 | A2P1-NWU-53-10-R | 4.5 | 5 | Uranium, Total | 9.158 | UJ | MG/KG |
| A2P1-NWU-53 | A2P1-NWU-53-3-R | 1 | 1.5 | Uranium, Total | 3.261 | U | MG/KG |
| A2P1-NWU-54 | A2P1-NWU-54-10-R | 4 | 4.5 | Radium-226 | 0.712 | - | PCI/G |
| A2P1-NWU-54 | A2P1-NWU-54-3-R | 1 | 1.5 | Radium-226 | 1.219 | - | PCI/G |
| A2P1-NWU-54 | A2P1-NWU-54-10-R | 4 | 4.5 | Radium-228 | 0.399 | - | PCI/G |
| A2P1-NWU-54 | A2P1-NWU-54-3-R | 1 | 1.5 | Radium-228 | 0.964 | - | PCI/G |
| A2P1-NWU-54 | A2P1-NWU-54-10-R | 4 | 4.5 | Thorium-228 | 0.386 | - | PCI/G |
| A2P1-NWU-54 | A2P1-NWU-54-3-R | 1 | 1.5 | Thorium-228 | 0.947 | - | PCI/G |
| A2P1-NWU-54 | A2P1-NWU-54-10-R | 4 | 4.5 | Thorium-232 | 0.399 | - | PCI/G |
| A2P1-NWU-54 | A2P1-NWU-54-3-R | 1 | 1.5 | Thorium-232 | 0.964 | - | PCI/G |
| A2P1-NWU-54 | A2P1-NWU-54-10-R | 4 | 4.5 | Uranium, Total | 2.931 | J | MG/KG |
| A2P1-NWU-54 | A2P1-NWU-54-3-R | 1 | 1.5 | Uranium, Total | 2.616 | U | MG/KG |
| A2P2-PT1-1 | A2P2-PT1-1-1-R | 0 | 1 | Radium-226 | 1.41 | - | PCI/G |
| A2P2-PT1-1 | A2P2-PT1-1-1-R | 0 | 1 | Radium-228 | 1.112 | - | PCI/G |
| A2P2-PT1-1 | A2P2-PT1-1-1-R | 0 | 1 | Thorium-228 | 1.095 | - | PCI/G |
| A2P2-PT1-1 | A2P2-PT1-1-1-R | 0 | 1 | Thorium-232 | 1.112 | - | PCI/G |
| A2P2-PT1-1 | A2P2-PT1-1-1-R | 0 | 1 | Uranium, Total | 6.601 | - | MG/KG |
| A2P2-PT1-2 | A2P2-PT1-2-1-R | 0 | 1 | Radium-226 | 1.498 | - | PCI/G |



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## APPENIDX A
## A2P1 PERIMETER AREA ANALYTICAL RESULTS

| BORING ID | SAMPLE ID | TOP DEPTH | BOTTOM DEPTH | PARAMETER | RESULT | QUALIFIER | UNITS |
|---|---|---|---|---|---|---|---|
| A2P2-PT1-2 | A2P2-PT1-2-1-R | 0 | 1 | Radium-228 | 1.183 | - | PCI/G |
| A2P2-PT1-2 | A2P2-PT1-2-1-R | 0 | 1 | Thorium-228 | 1.116 | - | PCI/G |
| A2P2-PT1-2 | A2P2-PT1-2-1-R | 0 | 1 | Thorium-232 | 1.183 | - | PCI/G |
| A2P2-PT1-2 | A2P2-PT1-2-1-R | 0 | 1 | Uranium, Total | 9.913 | - | MG/KG |
| A2P2-PT1-3 | A2P2-PT1-3-1-R | 0 | 1 | Radium-226 | 1.46 | - | PCI/G |
| A2P2-PT1-3 | A2P2-PT1-3-1-R | 0 | 1 | Radium-228 | 1.021 | - | PCI/G |
| A2P2-PT1-3 | A2P2-PT1-3-1-R | 0 | 1 | Thorium-228 | 1.001 | - | PCI/G |
| A2P2-PT1-3 | A2P2-PT1-3-1-R | 0 | 1 | Thorium-232 | 1.021 | - | PCI/G |
| A2P2-PT1-3 | A2P2-PT1-3-1-R | 0 | 1 | Uranium, Total | 6.086 | - | MG/KG |
| A2P2-PT1-4 | A2P2-PT1-4-1-R | 0 | 1 | Radium-226 | 1.322 | - | PCI/G |
| A2P2-PT1-4 | A2P2-PT1-4-1-R | 0 | 1 | Radium-228 | 0.894 | - | PCI/G |
| A2P2-PT1-4 | A2P2-PT1-4-1-R | 0 | 1 | Thorium-228 | 0.874 | - | PCI/G |
| A2P2-PT1-4 | A2P2-PT1-4-1-R | 0 | 1 | Thorium-232 | 0.894 | - | PCI/G |
| A2P2-PT1-4 | A2P2-PT1-4-1-R | 0 | 1 | Uranium, Total | 8.57 | - | MG/KG |
| A2P2-PT1-5-1 | A2P2-PT1-5-1-R | 0 | 1 | Radium-226 | 1.219 | - | PCI/G |
| A2P2-PT1-5-1 | A2P2-PT1-5-1-R | 0 | 1 | Radium-228 | 0.983 | - | PCI/G |
| A2P2-PT1-5-1 | A2P2-PT1-5-1-R | 0 | 1 | Thorium-228 | 0.916 | - | PCI/G |
| A2P2-PT1-5-1 | A2P2-PT1-5-1-R | 0 | 1 | Thorium-232 | 0.983 | - | PCI/G |
| A2P2-PT1-5-1 | A2P2-PT1-5-1-R | 0 | 1 | Uranium, Total | 10.605 | - | MG/KG |
| A2P2-PT1-6-1 | A2P2-PT1-6-1-R | 0 | 1 | Radium-226 | 1.154 | - | PCI/G |
| A2P2-PT1-6-1 | A2P2-PT1-6-1-R | 0 | 1 | Radium-228 | 0.995 | - | PCI/G |
| A2P2-PT1-6-1 | A2P2-PT1-6-1-R | 0 | 1 | Thorium-228 | 0.977 | - | PCI/G |
| A2P2-PT1-6-1 | A2P2-PT1-6-1-R | 0 | 1 | Thorium-232 | 0.995 | - | PCI/G |
| A2P2-PT1-6-1 | A2P2-PT1-6-1-R | 0 | 1 | Uranium, Total | 5.251 | J | MG/KG |
| A2P2-PT1-7-1 | A2P2-PT1-7-1-R | 0 | 1 | Radium-226 | 1.123 | - | PCI/G |
| A2P2-PT1-7-1 | A2P2-PT1-7-1-R | 0 | 1 | Radium-228 | 1.095 | - | PCI/G |
| A2P2-PT1-7-1 | A2P2-PT1-7-1-R | 0 | 1 | Thorium-228 | 1.089 | - | PCI/G |
| A2P2-PT1-7-1 | A2P2-PT1-7-1-R | 0 | 1 | Thorium-232 | 1.095 | - | PCI/G |
| A2P2-PT1-7-1 | A2P2-PT1-7-1-R | 0 | 1 | Uranium, Total | 7.295 | - | MG/KG |
| A2P2-PT1-8 | A2P2-PT1-8-1-R | 0 | 1 | Radium-226 | 1.3 | NV | PCI/G |
| A2P2-PT1-8 | A2P2-PT1-8-1-R | 0 | 1 | Radium-228 | 1 | NV | PCI/G |
| A2P2-PT1-8 | A2P2-PT1-8-1-R | 0 | 1 | Thorium-228 | 1 | NV | PCI/G |



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APPENIDX A
A2P1 PERIMETER AREA ANALYTICAL RESULTS

| BORING ID | SAMPLE ID | TOP DEPTH | BOTTOM DEPTH | PARAMETER | RESULT | QUALIFIER | UNITS |
|---|---|---|---|---|---|---|---|
| A2P2-PT1-8 | A2P2-PT1-8-1-R | 0 | 1 | Thorium-232 | 1 | NV | PCI/G |
| A2P2-PT1-8 | A2P2-PT1-8-1-R | 0 | 1 | Uranium, Total | 6.3 | NV | MG/KG |



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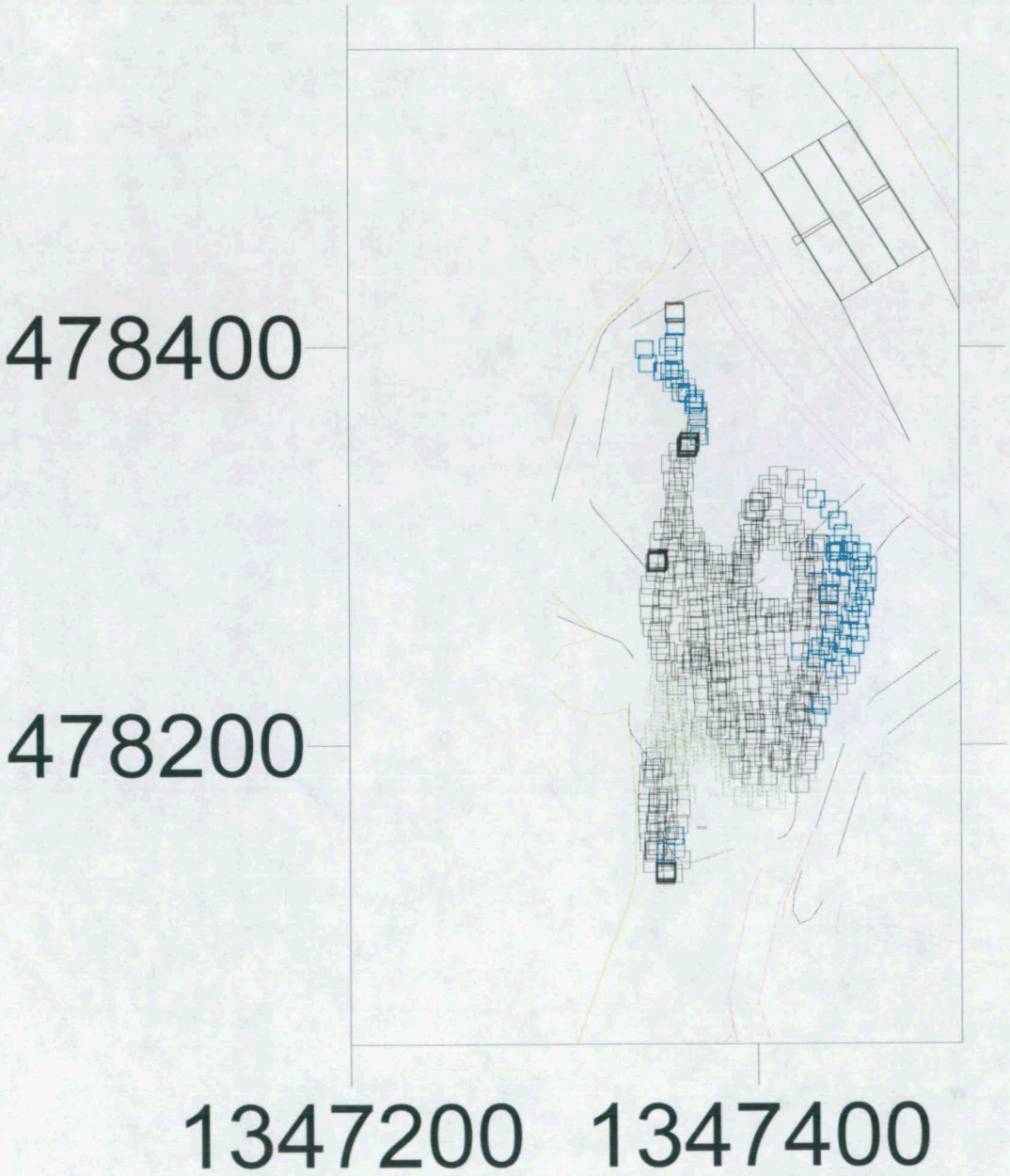
# A2P1 NWU NORTH

## Total Counts per Second

RTRK batch#: 776
Measurement date: 12/09/99
Field of View to scale

N




| RMS Counts per Second (cps) |
|---|
| 0.00 to 2000.00 |
| 2000.00 to 2500.00 |
| 2500.00 to 3000.00 |
| 3000.00 to 3500.00 |
| 3500.00 to 10000.00 |

HPGe locations shown for coverage only

RTIMP DWG Title: A2P1-NWU-NORTH-TC-1PT-MC.srf
Project #: 20400-PSP-0002
Project Name: A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P1_NWU_NORTH_TC_1PT_MC.srf
Date Prepared: 3/21/00

# A2P1 NWU NORTH

## Moisture Corrected Thorium 232

RTRK batch#: 776
Measurement date: 12/09/99
Field of View to scale

N

| RMS Th-232 pCi/gm |
|---|
| 0.03 to 0.75 |
| 0.75 to 1.50 |
| 1.50 to 3.00 |
| 3.00 to 4.50 |
| 4.50 to 10000.00 |

| HPGe Th-232 pCi/gm |
|---|
| 0.00 to 0.75 |
| 0.75 to 1.50 |
| 1.50 to 3.00 |
| 3.00 to 4.50 |
| 4.50 to 10000.00 |

RTIMP DWG Title: A2P1-NWU-NORTH-TH-2PT-MC.srf
Project #: 20400-PSP-0002
Project Name: A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P1_NWU_NORTH_TH_2PT_MC.srf
Date Prepared: 3/21/00

# A2P1 NWU NORTH

## Moisture and Radon Corrected Radium 226

RTRK batch#: 776
Measurement date: 12/09/99
Field of View to scale

N

| RMS Ra-226 pCi/gm |
|---|
| -0.02 to 0.85 |
| 0.85 to 1.70 |
| 1.70 to 3.40 |
| 3.40 to 5.10 |
| 5.10 to 10000.00 |

| HPGe Ra-226 pCi/gm |
|---|
| 0.00 to 0.85 |
| 0.85 to 1.70 |
| 1.70 to 3.40 |
| 3.40 to 5.10 |
| 5.10 to 10000.00 |

RTIMP DWG Title: A2P1-NWU-NORTH-RA-2PT-MC.srf
Project #: 20400-PSP-0002
Project Name: A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P1_NWU_NORTH_RA_2PT_MC.srf
Date Prepared: 3/21/00

# A2P1 NWU NORTH

## Moisture Corrected Total Uranium

RTRK batch#: 776
Measurement date: 12/09/99
Field of View to scale

N

RMS
Total Uranium in ppm

- 5.00 to 41.00
- 41.00 to 82.00
- 82.00 to 164.00
- 164.00 to 246.00
- 246.00 to 10000.00

HPGe
Total Uranium in ppm

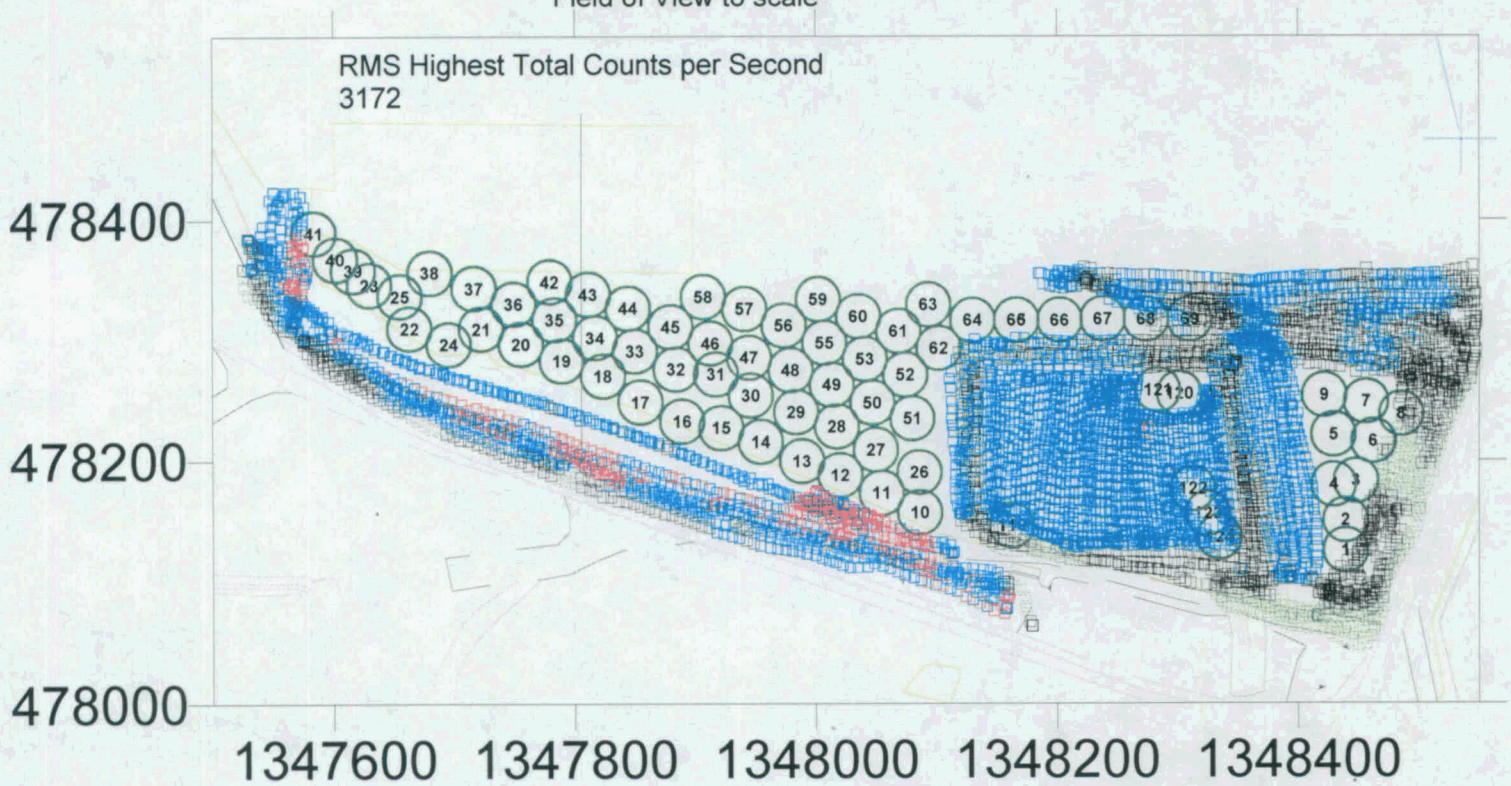
- 0.00 to 41.00
- 41.00 to 82.00
- 82.00 to 164.00
- 164.00 to 246.00
- 246.00 to 10000.00

RTIMP DWG Title: A2P1-NWU-NORTH-TU-2PT-MC.srf
Project #: 20400-PSP-0002
Project Name: A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P1_NWU_NORTH_TU_2PT_MC.srf
Date Prepared: 3/21/00

# A2P2 PART ONE

## Total Counts per Second

RTRK batch#: 768,776,786
RSS batch#: 582
Measurement dates from 11/19/99 to 06/09/00
Field of View to scale




N

| RMS Counts per Second (cps) |
|---|
| 0.00 to 2000.00 |
| 2000.00 to 2500.00 |
| 2500.00 to 3000.00 |
| 3000.00 to 3500.00 |
| 3500.00 to 10000.00 |

HPGe locations shown for coverage only

RTIMP DWG Title: A2P2-PT1-TC-1PT-MC.srf
Project #: 20400-PSP-0002
Project Name; A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P2_PT1_TC_1PT_MC.srf
Date Prepared: 6/12/00

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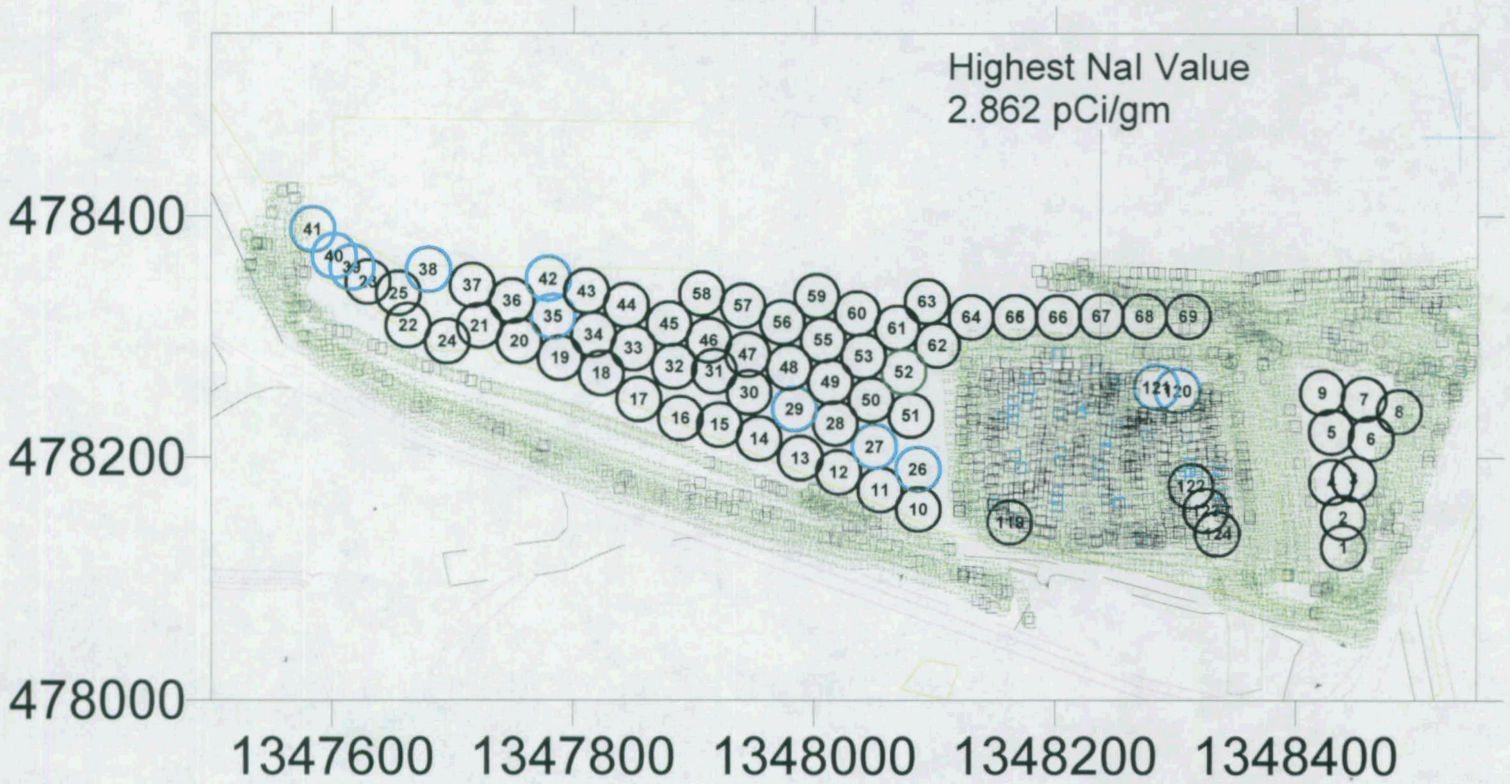
# A2P2 PART ONE

## Moisture and Corrected Radium 226

RTRK batch#: 768,776,786
RSS batch#: 582
Measurement dates from 11/19/99 to 06/09/00
Field of View to scale

N




| RMS Ra-226 pCi/gm |
|---|
| -0.17 to 0.85 |
| 0.85 to 1.70 |
| 1.70 to 3.40 |
| 3.40 to 5.10 |
| 5.10 to 10000.00 |

| HPGe Ra-226 pCi/gm |
|---|
| 0.00 to 0.85 |
| 0.85 to 1.70 |
| 1.70 to 3.40 |
| 3.40 to 5.10 |
| 5.10 to 10000.00 |

RTIMP DWG Title: A2P2-PT1-RA-2PT-MC.srf
Project #: 20400-PSP-0002
Project Name; A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P2_PT1_RA_2PT_MC.srf
Date Prepared: 6/12/00

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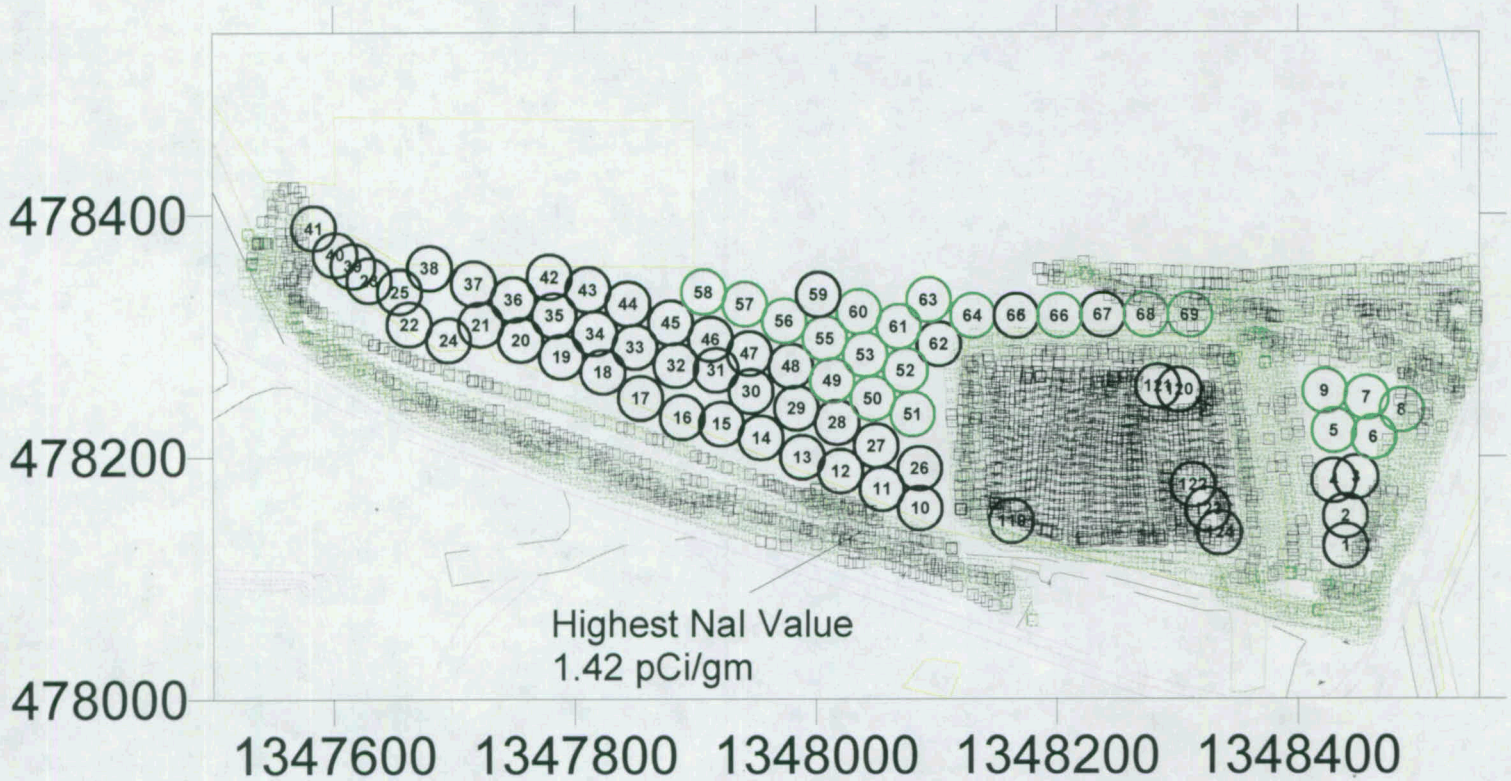
# A2P2 PART ONE

## Moisture Corrected Thorium 232

RTRK batch#: 768,776,786
RSS batch#: 582
Measurement dates from 11/19/99 to 06/09/00
Field of View to scale

N




| RMS Th-232 pCi/gm | HPGe Th-232 pCi/gm |
|---|---|
| -0.09 to 0.75 | 0.00 to 0.75 |
| 0.75 to 1.50 | 0.75 to 1.50 |
| 1.50 to 3.00 | 1.50 to 3.00 |
| 3.00 to 4.50 | 3.00 to 4.50 |
| 4.50 to 10000.00 | 4.50 to 10000.00 |

RTIMP DWG Title: A2P2-PT1-TH-2PT-MC.srf
Project #: 20400-PSP-0002
Project Name; A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P2_PT1_TH_2PT_MC.srf
Date Prepared: 6/12/00

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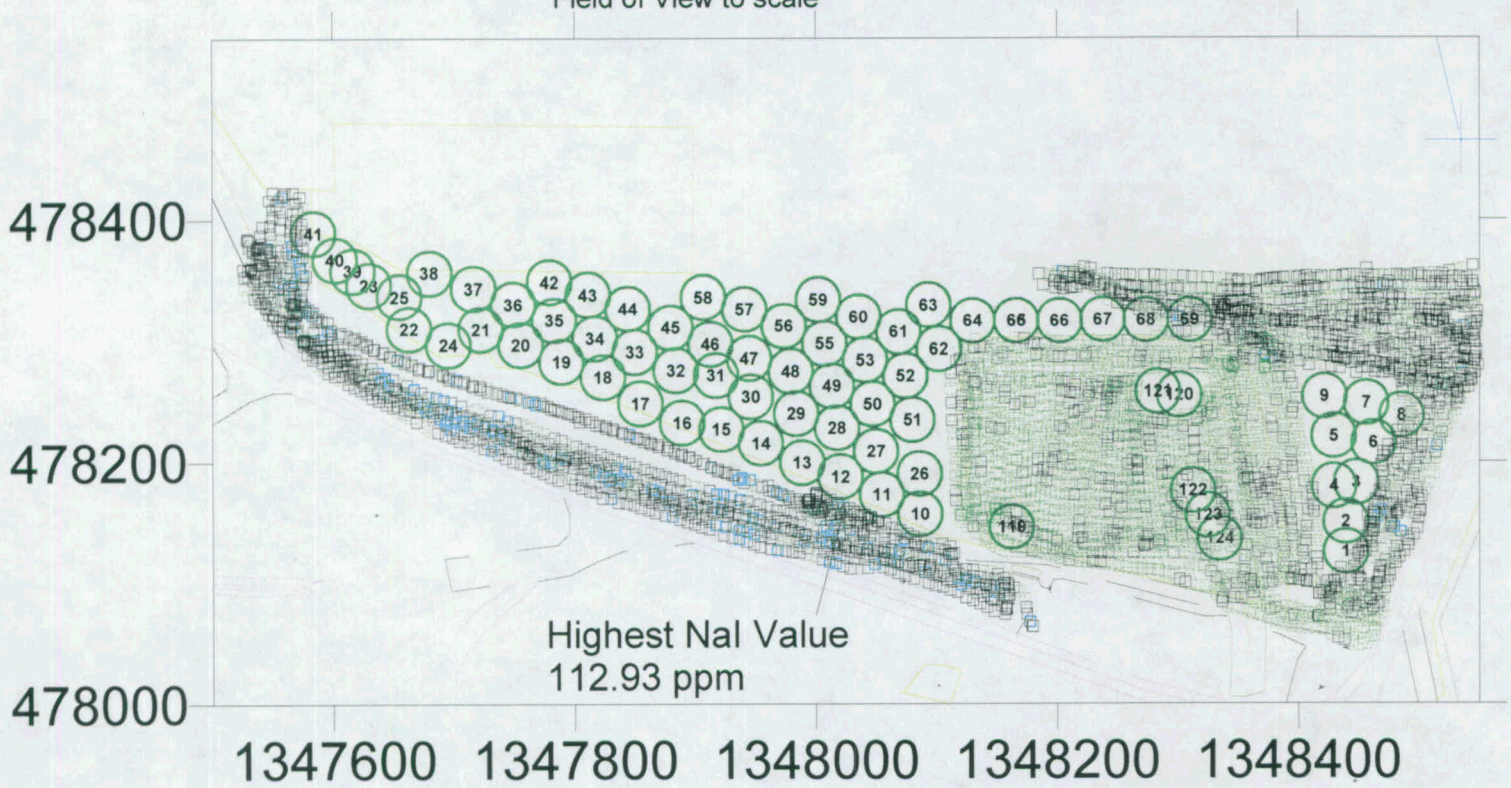
F-3683

# A2P2 PART ONE

## Moisture Corrected Total Uranium

RTRK batch#: 768,776,786
RSS batch#: 582
Measurement dates from 11/19/99 to 06/09/00
Field of View to scale

N




| RMS Total Uranium in ppm |
|---|
| -19.00 to 41.00 |
| 41.00 to 82.00 |
| 82.00 to 164.00 |
| 164.00 to 246.00 |
| 246.00 to 10000.00 |

| HPGe Total Uranium in ppm |
|---|
| 0.00 to 41.00 |
| 41.00 to 82.00 |
| 82.00 to 164.00 |
| 164.00 to 246.00 |
| 246.00 to 10000.00 |

RTIMP DWG Title: A2P2-PT1-TU-2PT-MC.srf
Project #: 20400-PSP-0002
Project Name; A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P2_PT1_TU_2PT_MC.srf
Date Prepared: 6/12/00

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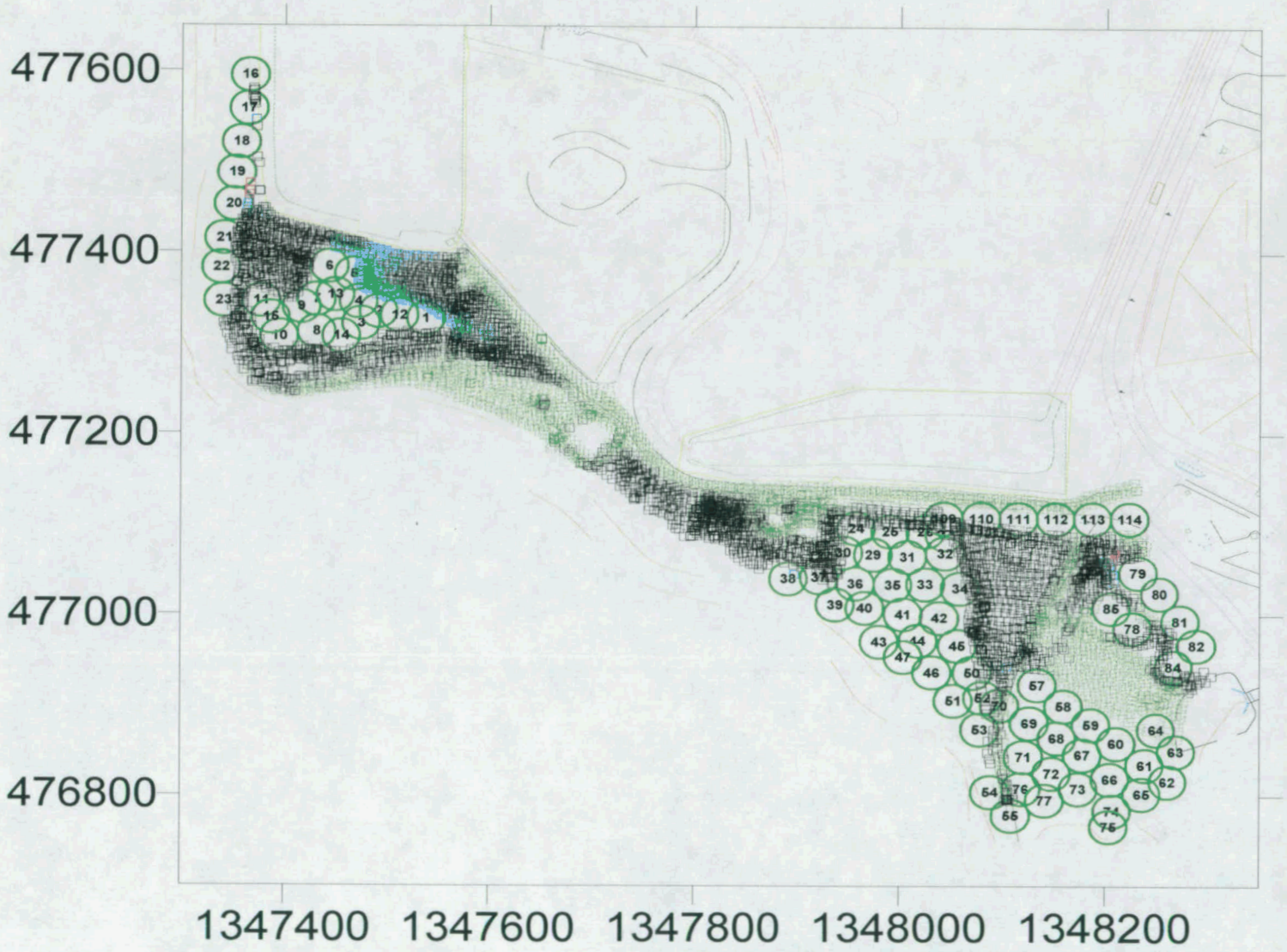
# A2P1 NWU CENTRAL

## Total Counts per Second

RTRK batch#: 766,767
RSS batch#: 486,487,496,501,512
Measurement dates from 10/14/99 to 3/01/00
Field of View to scale

N




| RMS Counts per Second (cps) |
|---|
| 0.00 to 2000.00 |
| 2000.00 to 2500.00 |
| 2500.00 to 3000.00 |
| 3000.00 to 3500.00 |
| 3500.00 to 10000.00 |

HPGe locations shown for coverage only

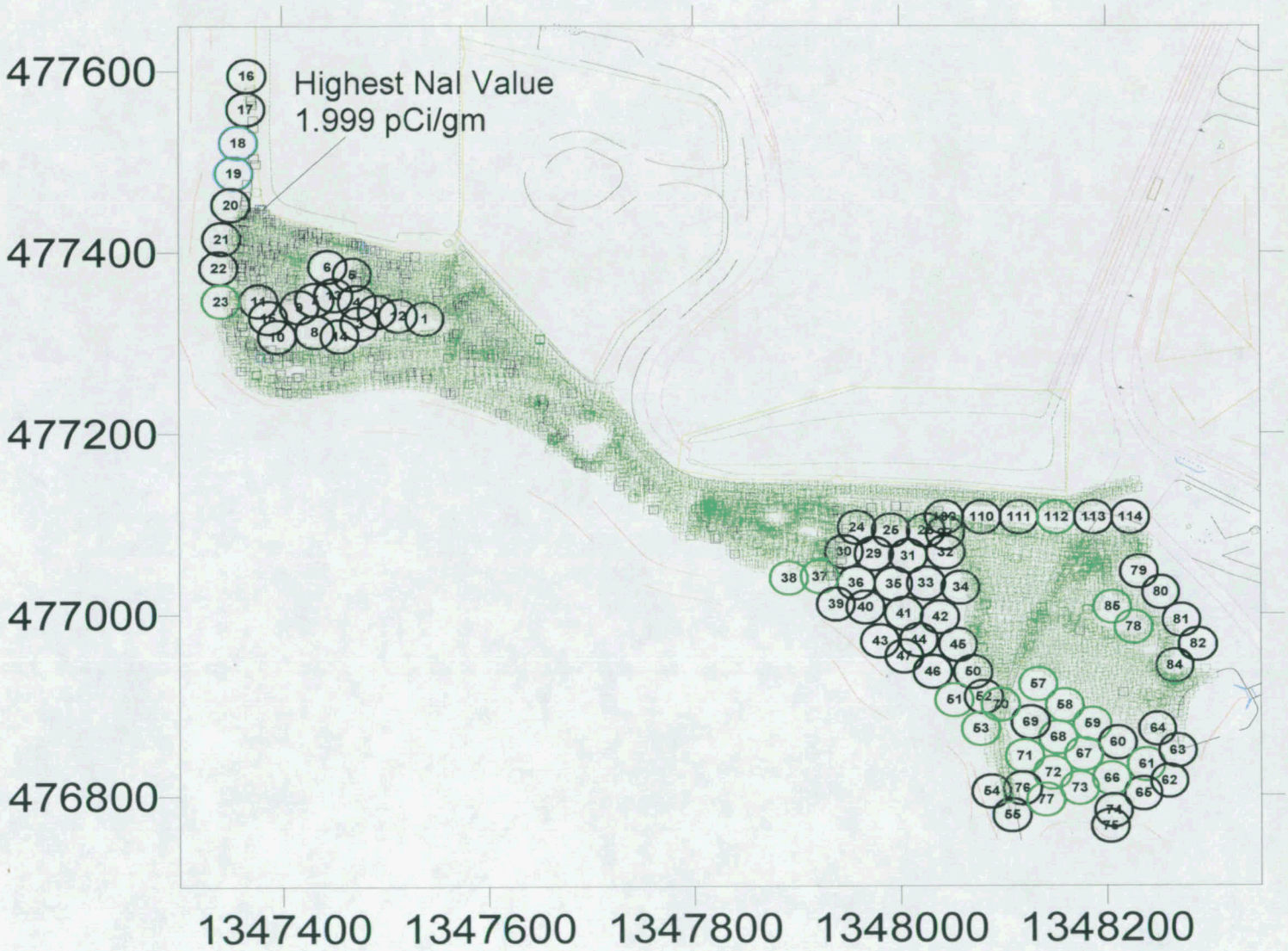
RTIMP DWG Title: A2P1-NWU-CENTRAL-TC-1PT-MC.srf
Project #: 20400-PSP-0002
Project Name: A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P1_NWU_CENTRAL_TC_1PT_MC.srf
Date Prepared: 3/20/00

# A2P1 NWU CENTRAL

## Moisture and Radon Corrected Radium 226

RTRK batch#: 766,767
RSS batch#: 486,487,496,501,512
Measurement dates from 10/14/99 to 3/01/00
Field of View to scale

N




| RMS Ra-226 pCi/gm | HPGe Ra-226 pCi/gm |
|---|---|
| -0.19 to 0.85 | 0.00 to 0.85 |
| 0.85 to 1.70 | 0.85 to 1.70 |
| 1.70 to 3.40 | 1.70 to 3.40 |
| 3.40 to 5.10 | 3.40 to 5.10 |
| 5.10 to 10000.00 | 5.10 to 10000.00 |

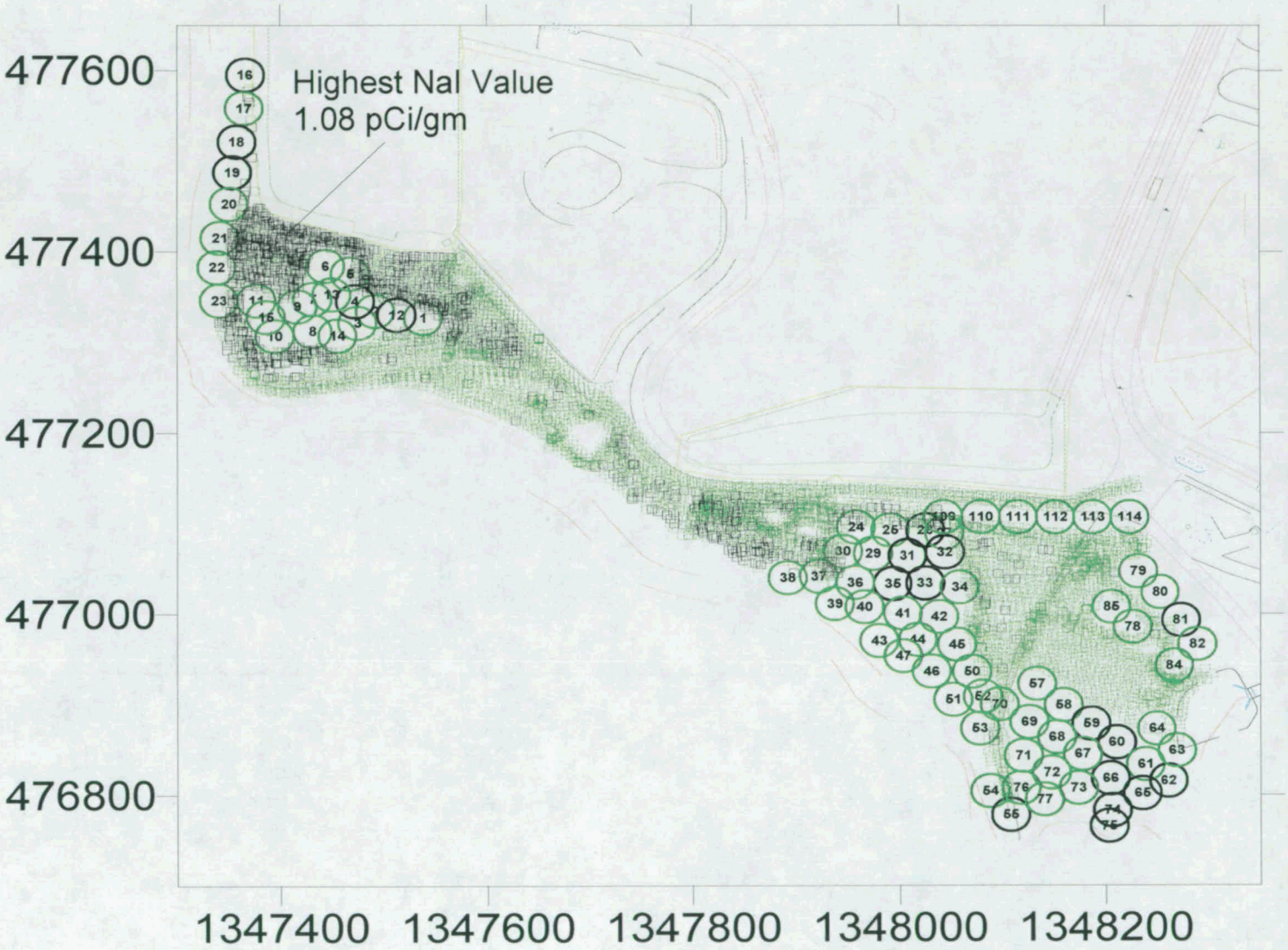
RTIMP DWG Title: A2P1-NWU-CENTRAL-RA-2PT-MC.srf
Project #: 20400-PSP-0002
Project Name: A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P1_NWU_CENTRAL_RA_2PT_MC.srf
Date Prepared: 3/20/00

# A2P1 NWU CENTRAL

## Moisture Corrected Thorium 232

RTRK batch#: 766,767
RSS batch#: 486,487,496,501,512
Measurement dates from 10/14/99 to 3/01/00
Field of View to scale

N




| RMS Th-232 pCi/gm |
|---|
| -0.26 to 0.75 |
| 0.75 to 1.50 |
| 1.50 to 3.00 |
| 3.00 to 4.50 |
| 4.50 to 10000.00 |

| HPGe Th-232 pCi/gm |
|---|
| 0.00 to 0.75 |
| 0.75 to 1.50 |
| 1.50 to 3.00 |
| 3.00 to 4.50 |
| 4.50 to 10000.00 |

RTIMP DWG Title: A2P1-NWU-CENTRAL-TH-2PT-MC.srf
Project #: 20400-PSP-0002
Project Name: A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P1_NWU_CENTRAL_TH_2PT_MC.srf
Date Prepared: 3/20/00

# A2P1 NWU CENTRAL

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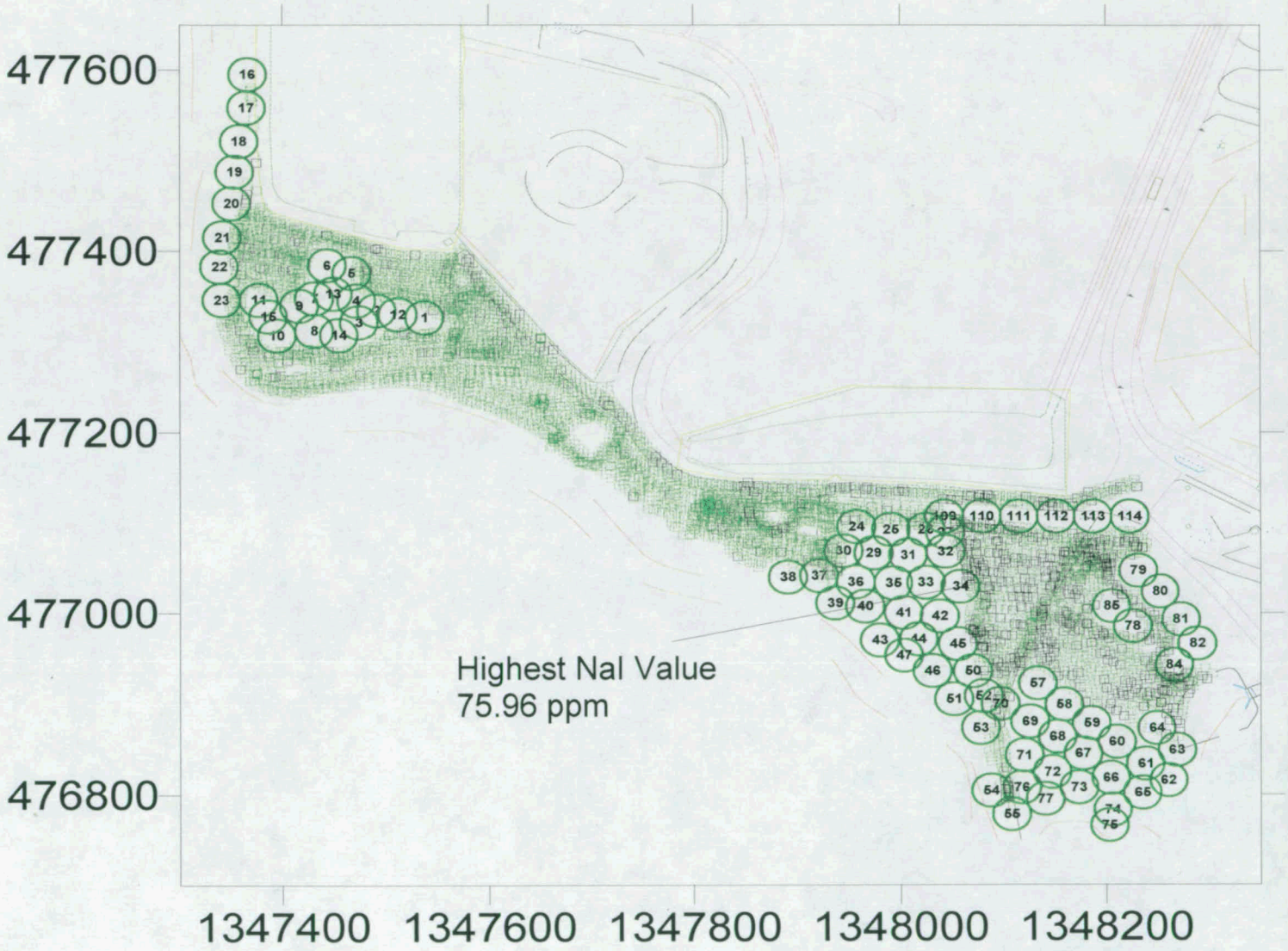
## Moisture Corrected Total Uranium

RTRK batch#: 766,767
RSS batch#: 486,487,496,501,512
Measurement dates from 10/14/99 to 3/01/00
Field of View to scale

N




| RMS Total Uranium in ppm |
|---|
| -54.00 to 41.00 |
| 41.00 to 82.00 |
| 82.00 to 164.00 |
| 164.00 to 246.00 |
| 246.00 to 10000.00 |

| HPGe Total Uranium in ppm |
|---|
| 0.00 to 41.00 |
| 41.00 to 82.00 |
| 82.00 to 164.00 |
| 164.00 to 246.00 |
| 246.00 to 10000.00 |

RTIMP DWG Title: A2P1-NWU-CENTRAL-TU-2PT-MC.srf
Project #: 20400-PSP-0002
Project Name: A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P1_NWU_CENTRAL_TU_2PT_MC.srf
Date Prepared: 3/17/00