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AREA 9, PHASE I PREDESIGN WORK PLAN

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

APRIL 2000

INFORMATION ONLY

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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LIST OF ACRONYMS AND ABBREVIATIONS

A1PI	Area 1, Phase I
A9PI	Area 9, Phase I
BTV	Benchmark Toxicity Value
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	constituent of concern
COEC	contaminant of ecological concern
DOE	Department of Energy
EPA	U.S. Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FRL	final remediation level
HPGe	high-purity germanium
mg/kg	milligrams per kilogram
NaI	sodium iodide
OEPA	Ohio Environmental Protection Agency
pCi/g	picoCuries per gram
PSP	Project Specific Plan
SEP	Sitewide Excavation Plan
V/FCN	Variance/Field Change Notice

1.0 INTRODUCTION

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1.1 BACKGROUND

Area 9, Phase I (A9PI) is the off-property land adjacent to Area 1, Phase I (A1PI). The eastern boundary of A9PI extends 750 feet east of and parallel to the eastern Fernald Environmental Management Project (FEMP) boundary. A9PI has historically been used for agriculture, and includes large cultivated fields on the south and northeast. The northwestern and central portions are made up of grazed pastureland separated by steep, wooded creek beds. Per agreements with the U.S. Environmental Protection Agency (EPA) and Ohio Environmental Protection Agency (OEPA), documented in the Addendum to the Operable Unit 5 Remedial Design Work Plan (DOE 1996), A9PI will be certified wherever remedial excavations took place on the adjacent portions of the FEMP.

As a first step toward certification, planned precertification activities included the traditional real-time scan, plus the collection of nine soil borings to a depth of 3 feet in the cultivated area (see Figure 1-1). Preparation for the work began in January 1998, however, problems obtaining access to this private property prevented the work from being conducted as planned. In Summer 1999, the U.S. Army Corp of Engineers was contacted to handle the access issue. The Access Agreement was finalized and signed on November 16, 1999. Precertification work began in A9PI shortly thereafter, as soon as necessary resources became available.

1.2 PRECERTIFICATION WORK COMPLETED

1.2.1 Physical Sampling and Results

In January 2000, the nine precertification borings were collected in A9PI. The samples were processed and analyzed according to the Project Specific Plan (PSP) for A9PI Precertification Physical Sampling (DOE 1999). The purpose of these borings was to determine the depth of plowing, evaluate how plowing has affected contamination distribution at depth, and to compare constituent of concern (COC) concentrations in soil against the more conservative off-property final remediation levels (FRLs). Upon collection, the project geologist, who determined that the depth of plowing ranged from 7 to 12 inches, examined the borings. All cores were divided into 6-inch depth increments and submitted to the on-site laboratory for analysis.

Results from the laboratory revealed concentrations above the off-property FRL for radium-226 [1.5 picoCuries per gram (pCi/g)], arsenic [9.6 milligrams per kilogram (mg/kg)] and beryllium (0.62 mg/kg). The other four primary radiological COCs (total uranium, radium-228, thorium-228 and thorium-232) were demonstrated to be below the FRL in all samples. The radium-226 exceedences were isolated and do not indicate a major problem for certification. However, the arsenic and beryllium results show concentrations sufficient to require the need for remedial excavation. Both of these metals are components of flyash, which was emitted from the FEMP Boiler Plant throughout the production years.

The highest beryllium FRL exceedences were found at depth in the four borings (numbers 3, 4, 8 and 9) immediately surrounding the "notch" in the FEMP eastern fence line (refer to Figure 1-1). This indicates that the beryllium contamination is localized within this part of A9PI as a contamination plume. At this point, the extent of this plume is not well defined given the sparse data.

While beryllium appears localized at depth, above-FRL arsenic concentrations were found in all nine borings and at all six depth increments. In addition, arsenic shows no apparent trend with distance from the site. Unfortunately, the current density of soil analytical data is insufficient to determine the extent of the above-FRL arsenic concentrations. All precertification physical sampling results are included in Appendix A of this document. Results from the key COCs are also illustrated as graphs in this appendix. Of note, manganese was also included as a target analyte because it was a contaminant of ecological concern (COEC) in A1PI. It was subsequently removed from consideration as a COEC as part of the evaluation documented in Appendix C of the Sitewide Excavation Plan (SEP, DOE 1998). Therefore, it has no related FRL or Benchmark Toxicity Value (BTV), and will not need to be evaluated further in A9PI.

1.2.2 Real-Time Scanning and Results

In December 1999, the precertification real-time scan began in the northwestern (unplowed) area. The scan was accomplished using the mobile sodium iodide (NaI) detectors in the open fields and the high-purity germanium (HPGe) detectors in steep or wooded areas. A small section (the northwestern corner) of the southern plowed area was also scanned in this same manner. Unfortunately, wet field conditions and snow cover prevented any further scanning after early January 2000. As of April 15, 2000, approximately 25 percent of A9PI has been scanned.

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All real-time scan results to-date are displayed in Appendix B as data maps. As shown on these maps, there are no major contamination problems in A9PI. All results were below the target levels (three times the FRL for the mobile NaI detectors; one times the FRL for the HPGe), with the exception of seven HPGe results that slightly exceeded the radium-226 FRL of 1.5 pCi/g. These readings were collected within a rather localized area in the unplowed pasture. Field conditions prevented the collection of the confirmation (31 cm) HPGe reading, so instead, a confirmation physical sample was collected at each of these seven locations and analyzed at the on-site laboratory for the primary radiological COCs. All of these analytical data, including the radium-226 results, came back below the off-property FRLs, thus demonstrating that there is no problem with radium-226 contamination in this part of A9PI. These confirmation physical sample results are also included in Appendix B.

During the delay in the real-time scan, the boring sample results were received and evaluated. Because they showed that the issue in A9PI is metals contamination at depth, the real-time detectors were no longer of use since this information is outside their capabilities. As a result, the remainder of the real-time scan has been cancelled.

1.3 PATH FORWARD

Based on the information obtained from the precertification borings, there are sufficient above-FRL concentrations of beryllium and arsenic in A9PI to require remedial action. In addition to reporting the precertification findings, the purpose of this Predesign Work Plan is to summarize findings-to-date and to discuss the plan for defining the extent of the above-FRL concentrations of arsenic and beryllium. Once defined, the cost of soil remediation can be established and used as the basis for a decision on how to address this situation.

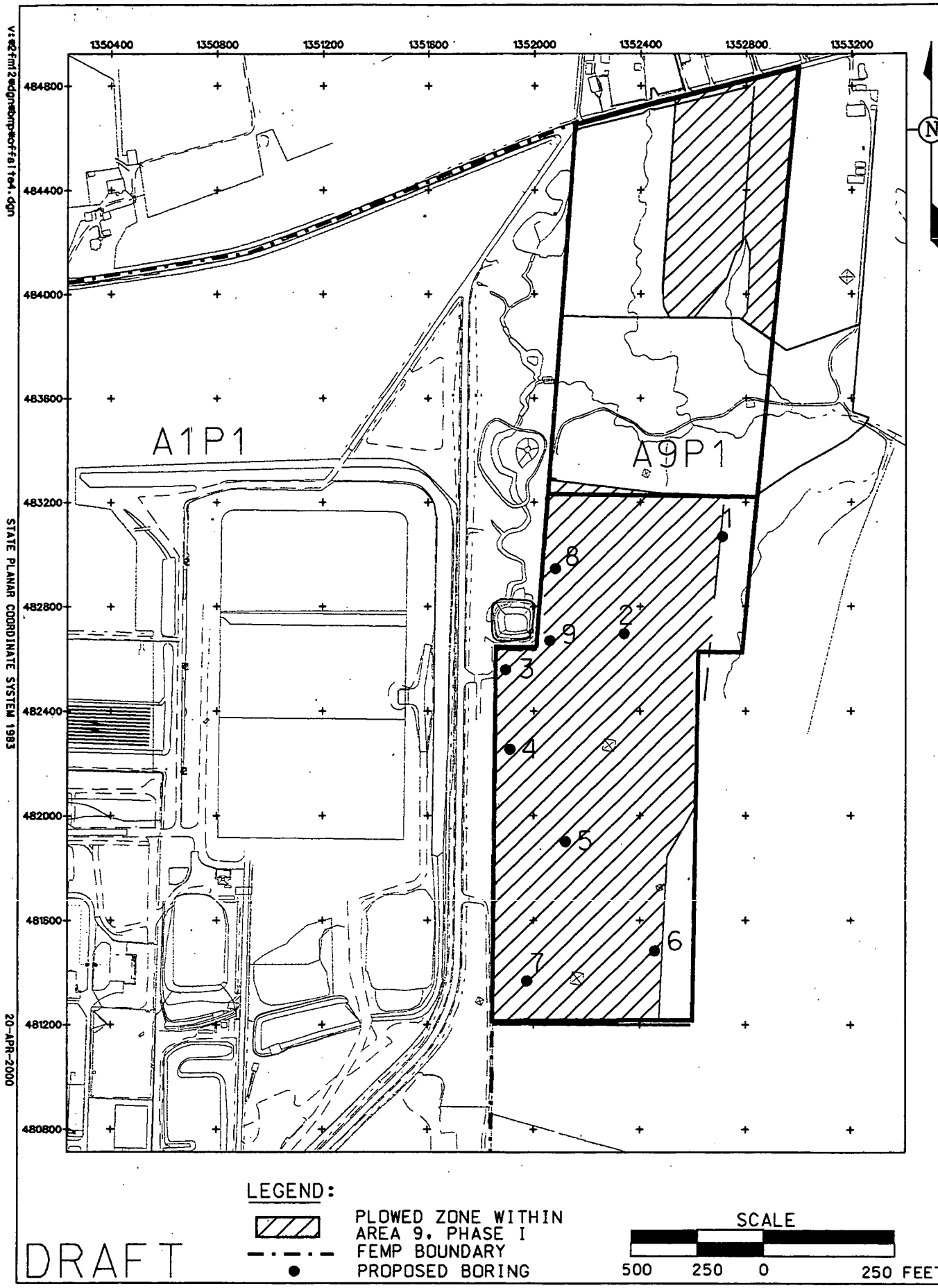

FIGURE 1-1. AREA 9, PHASE I PRE-CERTIFATION PHYSICAL SAMPLING LOCATIO

2.0 PREDESIGN INVESTIGATION SAMPLING PROGRAM

2.1 PROGRAM OVERVIEW AND OBJECTIVES

The predesign investigation program will be designed and conducted in such a manner to delineate the extent of above-FRL beryllium and arsenic concentrations in A9PI. The underlying assumption behind this sampling strategy is that there are definable plumes of above-FRL arsenic and beryllium concentrations within this soil that resulted from airborne deposition from the FEMP Boiler Plant. Soil sampling will be conducted on the surface and at depth throughout A9PI in a manner to delineate the extent of these plumes. This effort will likely involve a phased approach to sampling, where results from Phase I will guide subsequent sample locations and density.

2.2 PROPOSED PHASE I SAMPLING

Phase I predesign investigation sampling will consist of the collection of soil borings at 19 locations to a depth of 3 feet, along with the collection of four surface soil samples, as shown on Figure 2-1. The boring and sample locations have been established in such a manner to provide initial information about the extent of arsenic and beryllium contamination in A9PI.

Ten of the Phase I borings (locations 10 through 19) have been established along the estimated extent of the beryllium plume east of the four precertification borings that indicated beryllium contamination. Data from the borings will serve as a first step to help bound the beryllium-contaminated soil in A9PI. Nine more Phase I borings (locations 20 through 28) have been located to the north, east and south of where the nine original precertification borings were collected in order to provide information to help bound the above-FRL arsenic concentrations in A9PI. Beryllium will also be analyzed in borings 20 and 21 since beryllium concentrations in unplowed soil are still unknown. The Phase I sampling will also include a line of four surface samples (samples S1 through S4) established in a northeasterly direction (downwind of the FEMP) to investigate arsenic concentrations in soil. These sample results will be used to evaluate patterns of arsenic concentrations in surface soil at various distances from the FEMP. These data will also be used to determine the extent of potential remedial excavations required in A9PI.

More information on the collection and analysis of these soil samples is presented in the accompanying PSP for A9PI Predesign Investigation Sampling. Details on possible additional sampling phases are presented in Section 2.3 of this Work Plan.

2.3 POSSIBLE RESULTS AND SUBSEQUENT SAMPLING

Once results from the Phase I samples are returned and evaluated, additional borings may be necessary depending on what the results show. For instance, if the borings around the beryllium plume show above-FRL concentrations, another line of borings will be conducted further to the east to bound the beryllium plume. If these borings show below-FRL beryllium concentrations, more borings may be conducted to the west to provide tighter bounding.

Figure 2-1 shows the conceptual locations for additional borings that may need to be collected to the east or west of the Phase I borings. The line to the west of the planned borings shows where additional borings could be collected to refine beryllium plume should the Phase I data show below-FRL beryllium concentrations. The line to the east of the planned borings shows where more borings could be collected to bound the extent of beryllium contamination if the Phase I data show above-FRL concentrations. In another possible scenario, if location 10, which is closer to the beryllium plume, shows contamination, while locations 11 through 19 do not, the plume will be considered bounded. This information will be used in part to determine the extent of remedial excavations required in A9PI.

The situation with the arsenic contamination is similar to beryllium, in that the Phase I results will provide information to help bound the above-FRL concentrations east of the FEMP property line. Based on the Phase I results, additional borings may need to be collected further north, south and/or east of the plowed area. Because the nature of the above-FRL arsenic concentrations is considerably less defined than beryllium at this time, it is difficult to speculate exactly where these borings would be collected. It is possible that the above-FRL arsenic concentrations may extend further to the east of A9PI, and possibly onto the next property. Should this be the case, another access agreement with that property owner will be needed in order to conduct any additional soil investigations.

Once the beryllium and arsenic plumes are bounded and delineated, both at depth and east of the FEMP, the extent of excavation can be defined. The extent of contaminated soil requiring excavation can be used as the basis for a decision on how to address this problem.

2.4 ACCESS AGREEMENT

Before any sampling-related activities can begin in A9PI, an access agreement must be obtained from the landowner. Because this sampling will need to be conducted in a phased approach, it is important that the access agreement allow the flexibility to conduct this sampling as appropriate based on each round of analytical results. The U.S. Army Corps of Engineers is also responsible for negotiating this access agreement.

2.5 DELIVERABLES

Accompanying this Predesign Work Plan for A9PI is the PSP for A9PI Predesign Investigation Sampling. These documents serve as documentation of the precertification results and the proposed path forward for predesign investigation sampling. All additional phases of sampling will be documented in a Variance/Field Change Notice (V/FCN) to the PSP, and will require approval of the OEPA prior to implementation. All analytical data from this predesign investigation will be documented, along with the proposed path forward for remediation, in an implementation plan. This A9PI Implementation Plan will be submitted to the agencies on November 1, 2000.

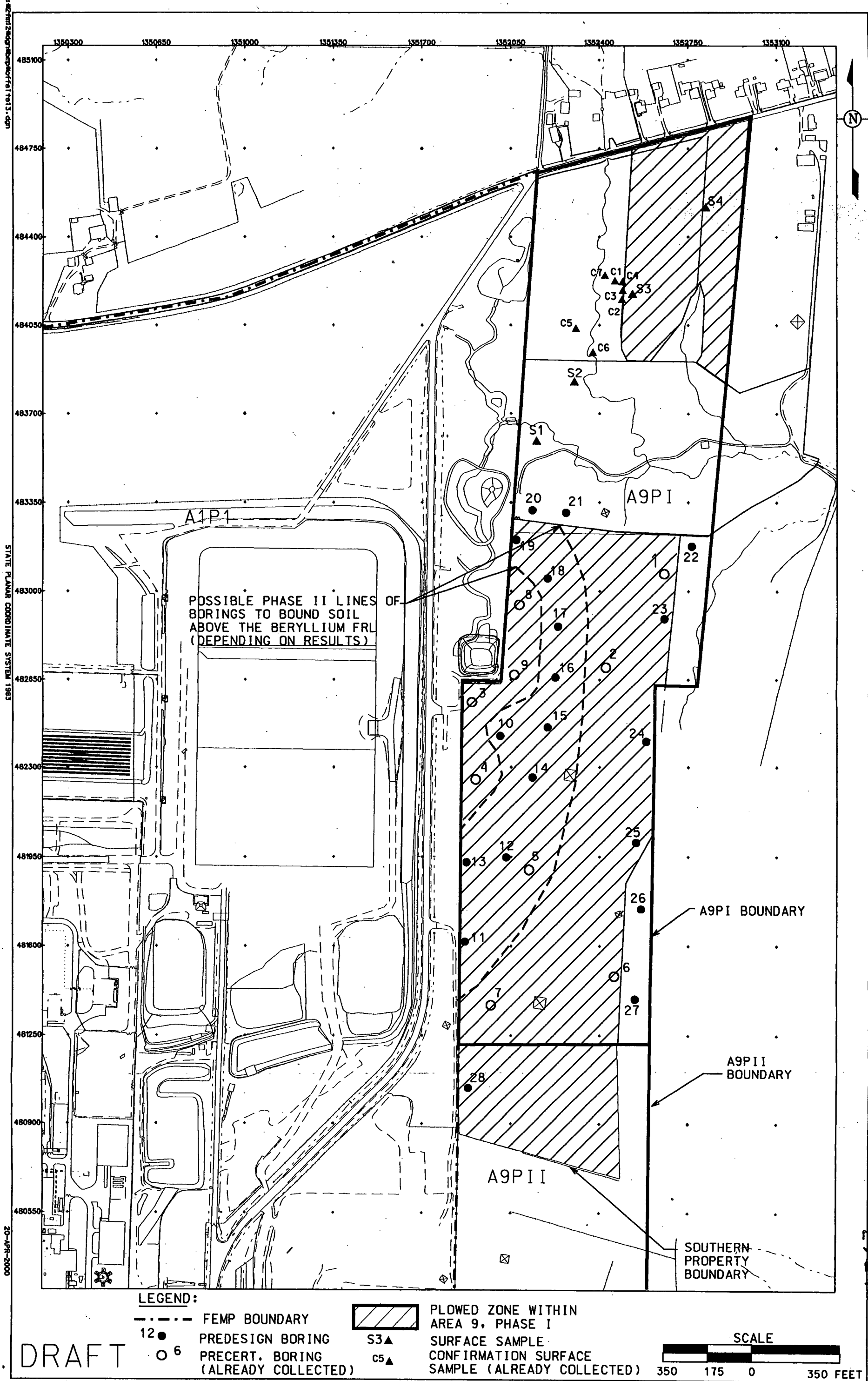

FIGURE 2-1. AREA 9, PHASE I PREDESIGN SAMPLING STRATEGY

3.0 PROPOSED SCHEDULE

The proposed schedule for the activities discussed in this Work Plan is detailed below:

TASK	DATE
Submit Predesign Work Plan and PSP	April 21, 2000
Obtain Access Agreement	May 21, 2000
Perform Soil Sampling Field Work	May 22, 2000
Receive Analytical Data	July 10, 2000
Discuss Results and Possible Phase II Sampling with EPA and OEPA	July 24, 2000
Perform Phase II Sampling (if necessary)	To Be Determined
Perform Additional Phases of Sampling (if necessary)	To Be Determined
Discuss Remedial Alternatives with EPA and OEPA	October 16, 2000
Document Selected Remedial Alternative	November 1, 2000

REFERENCES

U.S. Department of Energy, 1996, "Remedial Design Work Plan for Remedial Actions at Operable Unit 5," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 1998, "Sitewide Excavation Plan," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 1999, "Project Specific Plan for Area 9, Phase I Precertification Physical Sampling," Revision 4, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio.

APPENDIX A

AREA 9, PHASE I PRECERTIFICATION PHYSICAL SAMPLE DATA

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AREA 9, PHASE I PRECERTIFICATION PHYSICAL SAMPLE DATA

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Figure A-10 A9PI Thorium-232 Concentrations by Depth

TABLE A-1
A9PI PRECERTIFICATION SEGMENTED BORINGS - ANALYTICAL RESULTS

SAMPLE ID	DEPTH	ANALYTE	FRL	RESULT	UNITS	AB QUA	DATE SAMPLED
A9PI-P-1-1	0"-6"	ARSENIC	9.6	10.1	mg/kg dry		1/26/00 14:43
A9PI-P-1-2	6"-12"	ARSENIC	9.6	10.4	mg/kg dry		1/26/00 14:43
A9PI-P-1-3	12"-18"	ARSENIC	9.6	12.1	mg/kg dry		1/26/00 14:43
A9PI-P-1-4	18"-24"	ARSENIC	9.6	5.47	mg/kg dry		1/26/00 14:43
A9PI-P-1-5	24"-30"	ARSENIC	9.6	8.3	mg/kg dry		1/26/00 14:43
A9PI-P-1-6	30"-36"	ARSENIC	9.6	5.25	mg/kg dry		1/26/00 14:43
A9PI-P-2-1	0"-6"	ARSENIC	9.6	6.16	mg/kg dry		1/26/00 15:03
A9PI-P-2-2	6"-12"	ARSENIC	9.6	10.4	mg/kg dry		1/26/00 15:03
A9PI-P-2-3	12"-18"	ARSENIC	9.6	16.2	mg/kg dry		1/26/00 15:03
A9PI-P-2-4	18"-24"	ARSENIC	9.6	8.37	mg/kg dry		1/26/00 15:03
A9PI-P-2-5	24"-30"	ARSENIC	9.6	10.2	mg/kg dry		1/26/00 15:03
A9PI-P-2-6	30"-36"	ARSENIC	9.6	11.6	mg/kg dry		1/26/00 15:03
A9PI-P-3-1	0"-6"	ARSENIC	9.6	10.1	mg/kg dry		1/26/00 15:49
A9PI-P-3-2	6"-12"	ARSENIC	9.6	5.81	mg/kg dry		1/26/00 15:49
A9PI-P-3-3	12"-18"	ARSENIC	9.6	8.03	mg/kg dry		1/26/00 15:49
A9PI-P-3-4	18"-24"	ARSENIC	9.6	6.16	mg/kg dry		1/26/00 15:49
A9PI-P-3-5	24"-30"	ARSENIC	9.6	12.8	mg/kg dry		1/26/00 15:49
A9PI-P-3-6	30"-36"	ARSENIC	9.6	6.34	mg/kg dry		1/26/00 15:49
A9PI-P-4-1	0"-6"	ARSENIC	9.6	5.67	mg/kg dry		1/26/00 16:10
A9PI-P-4-2	6"-12"	ARSENIC	9.6	7.02	mg/kg dry		1/26/00 16:10
A9PI-P-4-3	12"-18"	ARSENIC	9.6	13.1	mg/kg dry		1/26/00 16:10
A9PI-P-4-4	18"-24"	ARSENIC	9.6	12.7	mg/kg dry		1/26/00 16:10
A9PI-P-4-5	24"-30"	ARSENIC	9.6	9	mg/kg dry		1/26/00 16:10
A9PI-P-4-6	30"-36"	ARSENIC	9.6	8.45	mg/kg dry		1/26/00 16:10
A9PI-P-5-1	0"-6"	ARSENIC	9.6	11.7	mg/kg dry		1/26/00 16:35
A9PI-P-5-2	6"-12"	ARSENIC	9.6	14.4	mg/kg dry		1/26/00 16:35
A9PI-P-5-3	12"-18"	ARSENIC	9.6	7.08	mg/kg dry		1/26/00 16:35
A9PI-P-5-4	18"-24"	ARSENIC	9.6	9.02	mg/kg dry		1/26/00 16:35
A9PI-P-5-5	24"-30"	ARSENIC	9.6	7	mg/kg dry		1/26/00 16:35
A9PI-P-5-6	30"-36"	ARSENIC	9.6	6.43	mg/kg dry		1/26/00 16:35
A9PI-P-6-1	0"-6"	ARSENIC	9.6	6.76	mg/kg dry		1/26/00 16:43
A9PI-P-6-2	6"-12"	ARSENIC	9.6	8.89	mg/kg dry		1/26/00 16:43
A9PI-P-6-3	12"-18"	ARSENIC	9.6	11.7	mg/kg dry		1/26/00 16:43
A9PI-P-6-4	18"-24"	ARSENIC	9.6	14.5	mg/kg dry		1/26/00 16:43
A9PI-P-6-5	24"-30"	ARSENIC	9.6	9.62	mg/kg dry		1/26/00 16:43
A9PI-P-6-6	30"-36"	ARSENIC	9.6	6.9	mg/kg dry		1/26/00 16:43
A9PI-P-7-1	0"-6"	ARSENIC	9.6	5.75	mg/kg dry		1/26/00 16:21
A9PI-P-7-2	6"-12"	ARSENIC	9.6	9.98	mg/kg dry		1/26/00 16:21
A9PI-P-7-3	12"-18"	ARSENIC	9.6	6.31	mg/kg dry		1/26/00 16:21
A9PI-P-7-4	18"-24"	ARSENIC	9.6	7.21	mg/kg dry		1/26/00 16:21
A9PI-P-7-5	24"-30"	ARSENIC	9.6	4.3	mg/kg dry		1/26/00 16:21
A9PI-P-7-6	30"-36"	ARSENIC	9.6	3.63	mg/kg dry		1/26/00 16:21
A9PI-P-8-1	0"-6"	ARSENIC	9.6	6.87	mg/kg dry		1/26/00 15:35
A9PI-P-8-2	6"-12"	ARSENIC	9.6	6.02	mg/kg dry		1/26/00 15:35
A9PI-P-8-3	12"-18"	ARSENIC	9.6	13.8	mg/kg dry		1/26/00 15:35
A9PI-P-8-4	18"-24"	ARSENIC	9.6	8.68	mg/kg dry		1/26/00 15:35

TABLE A-1
A9PI PRECERTIFICATION SEGMENTED BORINGS - ANALYTICAL RESULTS

SAMPLE ID	DEPTH	ANALYTE	FRL	RESULT	UNITS	AB QUA	DATE SAMPLED
A9PI-P-8-5	24"-30"	ARSENIC	9.6	10.1	mg/kg dry		1/26/00 15:35
A9PI-P-8-6	30"-36"	ARSENIC	9.6	6.4	mg/kg dry		1/26/00 15:35
A9PI-P-9-1	0"-6"	ARSENIC	9.6	6.98	mg/kg dry		1/26/00 15:18
A9PI-P-9-2	6"-12"	ARSENIC	9.6	8.78	mg/kg dry		1/26/00 15:18
A9PI-P-9-3	12"-18"	ARSENIC	9.6	5.23	mg/kg dry		1/26/00 15:18
A9PI-P-9-4	18"-24"	ARSENIC	9.6	9.19	mg/kg dry		1/26/00 15:18
A9PI-P-9-5	24"-30"	ARSENIC	9.6	11.4	mg/kg dry		1/26/00 15:18
A9PI-P-9-6	30"-36"	ARSENIC	9.6	9.17	mg/kg dry		1/26/00 15:18
A9PI-P-1-1	0"-6"	BERYLLIUM	0.62	0.43	mg/kg dry		1/26/00 14:43
A9PI-P-1-2	6"-12"	BERYLLIUM	0.62	0.032	mg/kg dry	U	1/26/00 14:43
A9PI-P-1-3	12"-18"	BERYLLIUM	0.62	0.029	mg/kg dry	U	1/26/00 14:43
A9PI-P-1-4	18"-24"	BERYLLIUM	0.62	0.24	mg/kg dry		1/26/00 14:43
A9PI-P-1-5	24"-30"	BERYLLIUM	0.62	0.44	mg/kg dry		1/26/00 14:43
A9PI-P-1-6	30"-36"	BERYLLIUM	0.62	0.51	mg/kg dry		1/26/00 14:43
A9PI-P-2-1	0"-6"	BERYLLIUM	0.62	0.18	mg/kg dry		1/26/00 15:03
A9PI-P-2-2	6"-12"	BERYLLIUM	0.62	0.03	mg/kg dry	U	1/26/00 15:03
A9PI-P-2-3	12"-18"	BERYLLIUM	0.62	0.031	mg/kg dry	U	1/26/00 15:03
A9PI-P-2-4	18"-24"	BERYLLIUM	0.62	0.32	mg/kg dry		1/26/00 15:03
A9PI-P-2-5	24"-30"	BERYLLIUM	0.62	0.62	mg/kg dry		1/26/00 15:03
A9PI-P-2-6	30"-36"	BERYLLIUM	0.62	0.2	mg/kg dry		1/26/00 15:03
A9PI-P-3-1	0"-6"	BERYLLIUM	0.62	0.51	mg/kg dry		1/26/00 15:49
A9PI-P-3-2	6"-12"	BERYLLIUM	0.62	0.24	mg/kg dry		1/26/00 15:49
A9PI-P-3-3	12"-18"	BERYLLIUM	0.62	0.58	mg/kg dry		1/26/00 15:49
A9PI-P-3-4	18"-24"	BERYLLIUM	0.62	1.12	mg/kg dry		1/26/00 15:49
A9PI-P-3-5	24"-30"	BERYLLIUM	0.62	0.67	mg/kg dry		1/26/00 15:49
A9PI-P-3-6	30"-36"	BERYLLIUM	0.62	0.33	mg/kg dry		1/26/00 15:49
A9PI-P-4-1	0"-6"	BERYLLIUM	0.62	0.039	mg/kg dry		1/26/00 16:10
A9PI-P-4-2	6"-12"	BERYLLIUM	0.62	0.031	mg/kg dry	U	1/26/00 16:10
A9PI-P-4-3	12"-18"	BERYLLIUM	0.62	0.03	mg/kg dry	U	1/26/00 16:10
A9PI-P-4-4	18"-24"	BERYLLIUM	0.62	0.976	mg/kg dry		1/26/00 16:10
A9PI-P-4-5	24"-30"	BERYLLIUM	0.62	1.12	mg/kg dry		1/26/00 16:10
A9PI-P-4-6	30"-36"	BERYLLIUM	0.62	0.498	mg/kg dry		1/26/00 16:10
A9PI-P-5-1	0"-6"	BERYLLIUM	0.62	0.526	mg/kg dry		1/26/00 16:35
A9PI-P-5-2	6"-12"	BERYLLIUM	0.62	0.765	mg/kg dry		1/26/00 16:35
A9PI-P-5-3	12"-18"	BERYLLIUM	0.62	0.65	mg/kg dry		1/26/00 16:35
A9PI-P-5-4	18"-24"	BERYLLIUM	0.62	0.521	mg/kg dry		1/26/00 16:35
A9PI-P-5-5	24"-30"	BERYLLIUM	0.62	0.263	mg/kg dry		1/26/00 16:35
A9PI-P-5-6	30"-36"	BERYLLIUM	0.62	0.293	mg/kg dry		1/26/00 16:35
A9PI-P-6-1	0"-6"	BERYLLIUM	0.62	0.091	mg/kg dry		1/26/00 16:43
A9PI-P-6-2	6"-12"	BERYLLIUM	0.62	0.268	mg/kg dry		1/26/00 16:43
A9PI-P-6-3	12"-18"	BERYLLIUM	0.62	0.428	mg/kg dry		1/26/00 16:43
A9PI-P-6-4	18"-24"	BERYLLIUM	0.62	0.511	mg/kg dry		1/26/00 16:43
A9PI-P-6-5	24"-30"	BERYLLIUM	0.62	0.685	mg/kg dry		1/26/00 16:43
A9PI-P-6-6	30"-36"	BERYLLIUM	0.62	0.528	mg/kg dry		1/26/00 16:43
A9PI-P-7-1	0"-6"	BERYLLIUM	0.62	0.224	mg/kg dry		1/26/00 16:21
A9PI-P-7-2	6"-12"	BERYLLIUM	0.62	0.362	mg/kg dry		1/26/00 16:21

TABLE A-1
A9PI PRECERTIFICATION SEGMENTED BORINGS - ANALYTICAL RESULTS

SAMPLE ID	DEPTH	ANALYTE	FRL	RESULT	UNITS	AB QUA	DATE SAMPLED
A9PI-P-7-3	12"-18"	BERYLLIUM	0.62	0.569	mg/kg dry		1/26/00 16:21
A9PI-P-7-4	18"-24"	BERYLLIUM	0.62	0.572	mg/kg dry		1/26/00 16:21
A9PI-P-7-5	24"-30"	BERYLLIUM	0.62	0.53	mg/kg dry		1/26/00 16:21
A9PI-P-7-6	30"-36"	BERYLLIUM	0.62	0.35	mg/kg dry		1/26/00 16:21
A9PI-P-8-1	0"-6"	BERYLLIUM	0.62	0.041	mg/kg dry		1/26/00 15:35
A9PI-P-8-2	6"-12"	BERYLLIUM	0.62	0.028	mg/kg dry	U	1/26/00 15:35
A9PI-P-8-3	12"-18"	BERYLLIUM	0.62	0.094	mg/kg dry		1/26/00 15:35
A9PI-P-8-4	18"-24"	BERYLLIUM	0.62	2.32	mg/kg dry		1/26/00 15:35
A9PI-P-8-5	24"-30"	BERYLLIUM	0.62	0.73	mg/kg dry		1/26/00 15:35
A9PI-P-8-6	30"-36"	BERYLLIUM	0.62	0.28	mg/kg dry		1/26/00 15:35
A9PI-P-9-1	0"-6"	BERYLLIUM	0.62	0.14	mg/kg dry		1/26/00 15:18
A9PI-P-9-2	6"-12"	BERYLLIUM	0.62	0.54	mg/kg dry		1/26/00 15:18
A9PI-P-9-3	12"-18"	BERYLLIUM	0.62	0.88	mg/kg dry		1/26/00 15:18
A9PI-P-9-4	18"-24"	BERYLLIUM	0.62	0.77	mg/kg dry		1/26/00 15:18
A9PI-P-9-5	24"-30"	BERYLLIUM	0.62	0.65	mg/kg dry		1/26/00 15:18
A9PI-P-9-6	30"-36"	BERYLLIUM	0.62	0.56	mg/kg dry		1/26/00 15:18
A9PI-P-1-1	0"-6"	MANGANESE	N/A	7600	mg/kg dry		1/26/00 14:43
A9PI-P-1-2	6"-12"	MANGANESE	N/A	1134	mg/kg dry		1/26/00 14:43
A9PI-P-1-3	12"-18"	MANGANESE	N/A	203	mg/kg dry		1/26/00 14:43
A9PI-P-1-4	18"-24"	MANGANESE	N/A	99	mg/kg dry		1/26/00 14:43
A9PI-P-1-5	24"-30"	MANGANESE	N/A	108	mg/kg dry		1/26/00 14:43
A9PI-P-1-6	30"-36"	MANGANESE	N/A	240	mg/kg dry		1/26/00 14:43
A9PI-P-2-1	0"-6"	MANGANESE	N/A	958	mg/kg dry		1/26/00 15:03
A9PI-P-2-2	6"-12"	MANGANESE	N/A	273	mg/kg dry		1/26/00 15:03
A9PI-P-2-3	12"-18"	MANGANESE	N/A	110	mg/kg dry		1/26/00 15:03
A9PI-P-2-4	18"-24"	MANGANESE	N/A	148	mg/kg dry		1/26/00 15:03
A9PI-P-2-5	24"-30"	MANGANESE	N/A	204	mg/kg dry		1/26/00 15:03
A9PI-P-2-6	30"-36"	MANGANESE	N/A	214	mg/kg dry		1/26/00 15:03
A9PI-P-3-1	0"-6"	MANGANESE	N/A	2180	mg/kg dry		1/26/00 15:49
A9PI-P-3-2	6"-12"	MANGANESE	N/A	373	mg/kg dry		1/26/00 15:49
A9PI-P-3-3	12"-18"	MANGANESE	N/A	1030	mg/kg dry		1/26/00 15:49
A9PI-P-3-4	18"-24"	MANGANESE	N/A	529	mg/kg dry		1/26/00 15:49
A9PI-P-3-5	24"-30"	MANGANESE	N/A	814	mg/kg dry		1/26/00 15:49
A9PI-P-3-6	30"-36"	MANGANESE	N/A	638	mg/kg dry		1/26/00 15:49
A9PI-P-4-1	0"-6"	MANGANESE	N/A	966	mg/kg dry		1/26/00 16:10
A9PI-P-4-2	6"-12"	MANGANESE	N/A	1480	mg/kg dry		1/26/00 16:10
A9PI-P-4-3	12"-18"	MANGANESE	N/A	423	mg/kg dry		1/26/00 16:10
A9PI-P-4-4	18"-24"	MANGANESE	N/A	1880	mg/kg dry		1/26/00 16:10
A9PI-P-4-5	24"-30"	MANGANESE	N/A	222	mg/kg dry		1/26/00 16:10
A9PI-P-4-6	30"-36"	MANGANESE	N/A	1220	mg/kg dry		1/26/00 16:10
A9PI-P-5-1	0"-6"	MANGANESE	N/A	623	mg/kg dry		1/26/00 16:35
A9PI-P-5-2	6"-12"	MANGANESE	N/A	801	mg/kg dry		1/26/00 16:35
A9PI-P-5-3	12"-18"	MANGANESE	N/A	249	mg/kg dry		1/26/00 16:35
A9PI-P-5-4	18"-24"	MANGANESE	N/A	838	mg/kg dry		1/26/00 16:35
A9PI-P-5-5	24"-30"	MANGANESE	N/A	555	mg/kg dry		1/26/00 16:35
A9PI-P-5-6	30"-36"	MANGANESE	N/A	422	mg/kg dry		1/26/00 16:35

TABLE A-1
A9PI PRECERTIFICATION SEGMENTED BORINGS - ANALYTICAL RESULTS

SAMPLE ID	DEPTH	ANALYTE	FRL	RESULT	UNITS	AB QUA	DATE SAMPLED
A9PI-P-6-1	0"-6"	MANGANESE	N/A	308	mg/kg dry		1/26/00 16:43
A9PI-P-6-2	6"-12"	MANGANESE	N/A	206	mg/kg dry		1/26/00 16:43
A9PI-P-6-3	12"-18"	MANGANESE	N/A	358	mg/kg dry		1/26/00 16:43
A9PI-P-6-4	18"-24"	MANGANESE	N/A	450	mg/kg dry		1/26/00 16:43
A9PI-P-6-5	24"-30"	MANGANESE	N/A	774	mg/kg dry		1/26/00 16:43
A9PI-P-6-6	30"-36"	MANGANESE	N/A	434	mg/kg dry		1/26/00 16:43
A9PI-P-7-1	0"-6"	MANGANESE	N/A	736	mg/kg dry		1/26/00 16:21
A9PI-P-7-2	6"-12"	MANGANESE	N/A	7220	mg/kg dry		1/26/00 16:21
A9PI-P-7-3	12"-18"	MANGANESE	N/A	448	mg/kg dry		1/26/00 16:21
A9PI-P-7-4	18"-24"	MANGANESE	N/A	802	mg/kg dry		1/26/00 16:21
A9PI-P-7-5	24"-30"	MANGANESE	N/A	376	mg/kg dry		1/26/00 16:21
A9PI-P-7-6	30"-36"	MANGANESE	N/A	744	mg/kg dry		1/26/00 16:21
A9PI-P-8-1	0"-6"	MANGANESE	N/A	577	mg/kg dry		1/26/00 15:35
A9PI-P-8-2	6"-12"	MANGANESE	N/A	578	mg/kg dry		1/26/00 15:35
A9PI-P-8-3	12"-18"	MANGANESE	N/A	185	mg/kg dry		1/26/00 15:35
A9PI-P-8-4	18"-24"	MANGANESE	N/A	287	mg/kg dry		1/26/00 15:35
A9PI-P-8-5	24"-30"	MANGANESE	N/A	506	mg/kg dry		1/26/00 15:35
A9PI-P-8-6	30"-36"	MANGANESE	N/A	242	mg/kg dry		1/26/00 15:35
A9PI-P-9-1	0"-6"	MANGANESE	N/A	640	mg/kg dry		1/26/00 15:18
A9PI-P-9-2	6"-12"	MANGANESE	N/A	176	mg/kg dry		1/26/00 15:18
A9PI-P-9-3	12"-18"	MANGANESE	N/A	91.4	mg/kg dry		1/26/00 15:18
A9PI-P-9-4	18"-24"	MANGANESE	N/A	169	mg/kg dry		1/26/00 15:18
A9PI-P-9-5	24"-30"	MANGANESE	N/A	314	mg/kg dry		1/26/00 15:18
A9PI-P-9-6	30"-36"	MANGANESE	N/A	510	mg/kg dry		1/26/00 15:18
A9PI-P-1-1	0"-6"	RADIUM 226	1.5	1.3	pCi/g dry		1/31/00 14:55
A9PI-P-1-2	6"-12"	RADIUM 226	1.5	1.3	pCi/g dry		1/26/00 14:43
A9PI-P-1-3	12"-18"	RADIUM 226	1.5	1.3	pCi/g dry		1/26/00 14:43
A9PI-P-1-4	18"-24"	RADIUM 226	1.5	1.5	pCi/g dry		1/26/00 14:43
A9PI-P-1-5	24"-30"	RADIUM 226	1.5	1.7	pCi/g dry		1/26/00 14:43
A9PI-P-1-6	30"-36"	RADIUM 226	1.5	1.5	pCi/g dry		1/26/00 14:43
A9PI-P-2-1	0"-6"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 15:03
A9PI-P-2-2	6"-12"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 15:03
A9PI-P-2-3	12"-18"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 15:03
A9PI-P-2-4	18"-24"	RADIUM 226	1.5	1.5	pCi/g dry		1/26/00 15:03
A9PI-P-2-5	24"-30"	RADIUM 226	1.5	1.6	pCi/g dry		1/26/00 15:03
A9PI-P-2-6	30"-36"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 15:03
A9PI-P-3-1	0"-6"	RADIUM 226	1.5	1.3	pCi/g dry		1/26/00 15:49
A9PI-P-3-2	6"-12"	RADIUM 226	1.5	1.3	pCi/g dry		1/26/00 15:49
A9PI-P-3-3	12"-18"	RADIUM 226	1.5	1.3	pCi/g dry		1/26/00 15:49
A9PI-P-3-4	18"-24"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 15:49
A9PI-P-3-5	24"-30"	RADIUM 226	1.5	1.5	pCi/g dry		1/26/00 15:49
A9PI-P-3-6	30"-36"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 15:49
A9PI-P-4-1	0"-6"	RADIUM 226	1.5	1.2	pCi/g dry		1/26/00 16:10
A9PI-P-4-2	6"-12"	RADIUM 226	1.5	1.3	pCi/g dry		1/26/00 16:10
A9PI-P-4-3	12"-18"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 16:10
A9PI-P-4-4	18"-24"	RADIUM 226	1.5	1.7	pCi/g dry		1/26/00 16:10

TABLE A-1
A9PI PRECERTIFICATION SEGMENTED BORINGS - ANALYTICAL RESULTS

SAMPLE ID	DEPTH	ANALYTE	FRL	RESULT	UNITS	AB QUA	DATE SAMPLED
A9PI-P-4-5	24"-30"	RADIUM 226	1.5	1.6	pCi/g dry		1/26/00 16:10
A9PI-P-4-6	30"-36"	RADIUM 226	1.5	1.2	pCi/g dry		1/26/00 16:10
A9PI-P-5-1	0"-6"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 16:35
A9PI-P-5-2	6"-12"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 16:35
A9PI-P-5-3	12"-18"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 16:35
A9PI-P-5-4	18"-24"	RADIUM 226	1.5	1.3	pCi/g dry		1/26/00 16:35
A9PI-P-5-5	24"-30"	RADIUM 226	1.5	1.2	pCi/g dry		1/26/00 16:35
A9PI-P-5-6	30"-36"	RADIUM 226	1.5	0.89	pCi/g dry		1/26/00 16:35
A9PI-P-6-1	0"-6"	RADIUM 226	1.5	1.2	pCi/g dry		1/26/00 16:43
A9PI-P-6-2	6"-12"	RADIUM 226	1.5	1.5	pCi/g dry		1/26/00 16:43
A9PI-P-6-3	12"-18"	RADIUM 226	1.5	1.5	pCi/g dry		1/26/00 16:43
A9PI-P-6-4	18"-24"	RADIUM 226	1.5	1.5	pCi/g dry		1/26/00 16:43
A9PI-P-6-5	24"-30"	RADIUM 226	1.5	1.5	pCi/g dry		1/26/00 16:43
A9PI-P-6-6	30"-36"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 16:43
A9PI-P-7-1	0"-6"	RADIUM 226	1.5	1.3	pCi/g dry		1/26/00 16:21
A9PI-P-7-2	6"-12"	RADIUM 226	1.5	1.5	pCi/g dry		1/26/00 16:21
A9PI-P-7-3	12"-18"	RADIUM 226	1.5	1.5	pCi/g dry		1/26/00 16:21
A9PI-P-7-4	18"-24"	RADIUM 226	1.5	1.1	pCi/g dry		1/26/00 16:21
A9PI-P-7-5	24"-30"	RADIUM 226	1.5	0.93	pCi/g dry		1/26/00 16:21
A9PI-P-7-6	30"-36"	RADIUM 226	1.5	0.91	pCi/g dry		1/26/00 16:21
A9PI-P-8-1	0"-6"	RADIUM 226	1.5	1.2	pCi/g dry		1/26/00 15:35
A9PI-P-8-2	6"-12"	RADIUM 226	1.5	1.3	pCi/g dry		1/26/00 15:35
A9PI-P-8-3	12"-18"	RADIUM 226	1.5	1.3	pCi/g dry		1/26/00 15:35
A9PI-P-8-4	18"-24"	RADIUM 226	1.5	1.6	pCi/g dry		1/26/00 15:35
A9PI-P-8-5	24"-30"	RADIUM 226	1.5	1.6	pCi/g dry		1/26/00 15:35
A9PI-P-8-6	30"-36"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 15:35
A9PI-P-9-1	0"-6"	RADIUM 226	1.5	1.1	pCi/g dry		1/26/00 15:18
A9PI-P-9-2	6"-12"	RADIUM 226	1.5	1.4	pCi/g dry		1/26/00 15:18
A9PI-P-9-3	12"-18"	RADIUM 226	1.5	1.5	pCi/g dry		1/26/00 15:18
A9PI-P-9-4	18"-24"	RADIUM 226	1.5	1.5	pCi/g dry		1/26/00 15:18
A9PI-P-9-5	24"-30"	RADIUM 226	1.5	1.3	pCi/g dry		1/26/00 15:18
A9PI-P-9-6	30"-36"	RADIUM 226	1.5	1.3	pCi/g dry		1/26/00 15:18
A9PI-P-1-1	0"-6"	RADIUM 228	1.4	1.1	pCi/g dry		1/31/00 14:55
A9PI-P-1-2	6"-12"	RADIUM 228	1.4	1	pCi/g dry		1/26/00 14:43
A9PI-P-1-3	12"-18"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 14:43
A9PI-P-1-4	18"-24"	RADIUM 228	1.4	1.3	pCi/g dry		1/26/00 14:43
A9PI-P-1-5	24"-30"	RADIUM 228	1.4	1.3	pCi/g dry		1/26/00 14:43
A9PI-P-1-6	30"-36"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 14:43
A9PI-P-2-1	0"-6"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 15:03
A9PI-P-2-2	6"-12"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 15:03
A9PI-P-2-3	12"-18"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 15:03
A9PI-P-2-4	18"-24"	RADIUM 228	1.4	1.3	pCi/g dry		1/26/00 15:03
A9PI-P-2-5	24"-30"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 15:03
A9PI-P-2-6	30"-36"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 15:03
A9PI-P-3-1	0"-6"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 15:49
A9PI-P-3-2	6"-12"	RADIUM 228	1.4	1	pCi/g dry		1/26/00 15:49

TABLE A-1
A9PI PRECERTIFICATION SEGMENTED BORINGS - ANALYTICAL RESULTS

SAMPLE ID	DEPTH	ANALYTE	FRL	RESULT	UNITS	AB QUA	DATE SAMPLED
A9PI-P-3-3	12"-18"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 15:49
A9PI-P-3-4	18"-24"	RADIUM 228	1.4	1.3	pCi/g dry		1/26/00 15:49
A9PI-P-3-5	24"-30"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 15:49
A9PI-P-3-6	30"-36"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 15:49
A9PI-P-4-1	0"-6"	RADIUM 228	1.4	1	pCi/g dry		1/26/00 16:10
A9PI-P-4-2	6"-12"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 16:10
A9PI-P-4-3	12"-18"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 16:10
A9PI-P-4-4	18"-24"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 16:10
A9PI-P-4-5	24"-30"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 16:10
A9PI-P-4-6	30"-36"	RADIUM 228	1.4	1	pCi/g dry		1/26/00 16:10
A9PI-P-5-1	0"-6"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 16:35
A9PI-P-5-2	6"-12"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 16:35
A9PI-P-5-3	12"-18"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 16:35
A9PI-P-5-4	18"-24"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 16:35
A9PI-P-5-5	24"-30"	RADIUM 228	1.4	0.92	pCi/g dry		1/26/00 16:35
A9PI-P-5-6	30"-36"	RADIUM 228	1.4	0.69	pCi/g dry		1/26/00 16:35
A9PI-P-6-1	0"-6"	RADIUM 228	1.4	1	pCi/g dry		1/26/00 16:43
A9PI-P-6-2	6"-12"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 16:43
A9PI-P-6-3	12"-18"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 16:43
A9PI-P-6-4	18"-24"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 16:43
A9PI-P-6-5	24"-30"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 16:43
A9PI-P-6-6	30"-36"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 16:43
A9PI-P-7-1	0"-6"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 16:21
A9PI-P-7-2	6"-12"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 16:21
A9PI-P-7-3	12"-18"	RADIUM 228	1.4	1.3	pCi/g dry		1/26/00 16:21
A9PI-P-7-4	18"-24"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 16:21
A9PI-P-7-5	24"-30"	RADIUM 228	1.4	0.94	pCi/g dry		1/26/00 16:21
A9PI-P-7-6	30"-36"	RADIUM 228	1.4	0.77	pCi/g dry		1/26/00 16:21
A9PI-P-8-1	0"-6"	RADIUM 228	1.4	0.98	pCi/g dry		1/26/00 15:35
A9PI-P-8-2	6"-12"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 15:35
A9PI-P-8-3	12"-18"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 15:35
A9PI-P-8-4	18"-24"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 15:35
A9PI-P-8-5	24"-30"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 15:35
A9PI-P-8-6	30"-36"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 15:35
A9PI-P-9-1	0"-6"	RADIUM 228	1.4	1	pCi/g dry		1/26/00 15:18
A9PI-P-9-2	6"-12"	RADIUM 228	1.4	1.2	pCi/g dry		1/26/00 15:18
A9PI-P-9-3	12"-18"	RADIUM 228	1.4	1.3	pCi/g dry		1/26/00 15:18
A9PI-P-9-4	18"-24"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 15:18
A9PI-P-9-5	24"-30"	RADIUM 228	1.4	1.1	pCi/g dry		1/26/00 15:18
A9PI-P-9-6	30"-36"	RADIUM 228	1.4	1	pCi/g dry		1/26/00 15:18
A9PI-P-1-1	0"-6"	THORIUM 228	1.5	1.1	pCi/g dry		1/31/00 14:55
A9PI-P-1-2	6"-12"	THORIUM 228	1.5	1	pCi/g dry		1/26/00 14:43
A9PI-P-1-3	12"-18"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 14:43
A9PI-P-1-4	18"-24"	THORIUM 228	1.5	1.3	pCi/g dry		1/26/00 14:43
A9PI-P-1-5	24"-30"	THORIUM 228	1.5	1.3	pCi/g dry		1/26/00 14:43
A9PI-P-1-6	30"-36"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 14:43

TABLE A-1
A9PI PRECERTIFICATION SEGMENTED BORINGS - ANALYTICAL RESULTS

SAMPLE ID	DEPTH	ANALYTE	FRL	RESULT	UNITS	AB QUA	DATE SAMPLED
A9PI-P-2-1	0"-6"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 15:03
A9PI-P-2-2	6"-12"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 15:03
A9PI-P-2-3	12"-18"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 15:03
A9PI-P-2-4	18"-24"	THORIUM 228	1.5	1.3	pCi/g dry		1/26/00 15:03
A9PI-P-2-5	24"-30"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 15:03
A9PI-P-2-6	30"-36"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 15:03
A9PI-P-3-1	0"-6"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 15:49
A9PI-P-3-2	6"-12"	THORIUM 228	1.5	0.98	pCi/g dry		1/26/00 15:49
A9PI-P-3-3	12"-18"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 15:49
A9PI-P-3-4	18"-24"	THORIUM 228	1.5	1.3	pCi/g dry		1/26/00 15:49
A9PI-P-3-5	24"-30"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 15:49
A9PI-P-3-6	30"-36"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 15:49
A9PI-P-4-1	0"-6"	THORIUM 228	1.5	0.97	pCi/g dry		1/26/00 16:10
A9PI-P-4-2	6"-12"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 16:10
A9PI-P-4-3	12"-18"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 16:10
A9PI-P-4-4	18"-24"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 16:10
A9PI-P-4-5	24"-30"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 16:10
A9PI-P-4-6	30"-36"	THORIUM 228	1.5	1	pCi/g dry		1/26/00 16:10
A9PI-P-5-1	0"-6"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 16:35
A9PI-P-5-2	6"-12"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 16:35
A9PI-P-5-3	12"-18"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 16:35
A9PI-P-5-4	18"-24"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 16:35
A9PI-P-5-5	24"-30"	THORIUM 228	1.5	0.9	pCi/g dry		1/26/00 16:35
A9PI-P-5-6	30"-36"	THORIUM 228	1.5	0.67	pCi/g dry		1/26/00 16:35
A9PI-P-6-1	0"-6"	THORIUM 228	1.5	1	pCi/g dry		1/26/00 16:43
A9PI-P-6-2	6"-12"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 16:43
A9PI-P-6-3	12"-18"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 16:43
A9PI-P-6-4	18"-24"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 16:43
A9PI-P-6-5	24"-30"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 16:43
A9PI-P-6-6	30"-36"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 16:43
A9PI-P-7-1	0"-6"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 16:21
A9PI-P-7-2	6"-12"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 16:21
A9PI-P-7-3	12"-18"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 16:21
A9PI-P-7-4	18"-24"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 16:21
A9PI-P-7-5	24"-30"	THORIUM 228	1.5	0.94	pCi/g dry		1/26/00 16:21
A9PI-P-7-6	30"-36"	THORIUM 228	1.5	0.79	pCi/g dry		1/26/00 16:21
A9PI-P-8-1	0"-6"	THORIUM 228	1.5	0.92	pCi/g dry		1/26/00 15:35
A9PI-P-8-2	6"-12"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 15:35
A9PI-P-8-3	12"-18"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 15:35
A9PI-P-8-4	18"-24"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 15:35
A9PI-P-8-5	24"-30"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 15:35
A9PI-P-8-6	30"-36"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 15:35
A9PI-P-9-1	0"-6"	THORIUM 228	1.5	0.99	pCi/g dry		1/26/00 15:18
A9PI-P-9-2	6"-12"	THORIUM 228	1.5	1.2	pCi/g dry		1/26/00 15:18
A9PI-P-9-3	12"-18"	THORIUM 228	1.5	1.3	pCi/g dry		1/26/00 15:18
A9PI-P-9-4	18"-24"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 15:18

TABLE A-1
A9PI PRECERTIFICATION SEGMENTED BORINGS - ANALYTICAL RESULTS

SAMPLE ID	DEPTH	ANALYTE	FRL	RESULT	UNITS	AB QUA	DATE SAMPLED
A9PI-P-9-5	24"-30"	THORIUM 228	1.5	1.1	pCi/g dry		1/26/00 15:18
A9PI-P-9-6	30"-36"	THORIUM 228	1.5	1	pCi/g dry		1/26/00 15:18
A9PI-P-1-1	0"-6"	THORIUM 232	1.4	1.1	pCi/g dry		1/31/00 14:55
A9PI-P-1-2	6"-12"	THORIUM 232	1.4	1	pCi/g dry		1/26/00 14:43
A9PI-P-1-3	12"-18"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 14:43
A9PI-P-1-4	18"-24"	THORIUM 232	1.4	1.3	pCi/g dry		1/26/00 14:43
A9PI-P-1-5	24"-30"	THORIUM 232	1.4	1.3	pCi/g dry		1/26/00 14:43
A9PI-P-1-6	30"-36"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 14:43
A9PI-P-2-1	0"-6"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 15:03
A9PI-P-2-2	6"-12"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 15:03
A9PI-P-2-3	12"-18"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 15:03
A9PI-P-2-4	18"-24"	THORIUM 232	1.4	1.3	pCi/g dry		1/26/00 15:03
A9PI-P-2-5	24"-30"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 15:03
A9PI-P-2-6	30"-36"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 15:03
A9PI-P-3-1	0"-6"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 15:49
A9PI-P-3-2	6"-12"	THORIUM 232	1.4	1	pCi/g dry		1/26/00 15:49
A9PI-P-3-3	12"-18"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 15:49
A9PI-P-3-4	18"-24"	THORIUM 232	1.4	1.3	pCi/g dry		1/26/00 15:49
A9PI-P-3-5	24"-30"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 15:49
A9PI-P-3-6	30"-36"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 15:49
A9PI-P-4-1	0"-6"	THORIUM 232	1.4	1	pCi/g dry		1/26/00 16:10
A9PI-P-4-2	6"-12"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 16:10
A9PI-P-4-3	12"-18"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 16:10
A9PI-P-4-4	18"-24"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 16:10
A9PI-P-4-5	24"-30"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 16:10
A9PI-P-4-6	30"-36"	THORIUM 232	1.4	1	pCi/g dry		1/26/00 16:10
A9PI-P-5-1	0"-6"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 16:35
A9PI-P-5-2	6"-12"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 16:35
A9PI-P-5-3	12"-18"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 16:35
A9PI-P-5-4	18"-24"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 16:35
A9PI-P-5-5	24"-30"	THORIUM 232	1.4	0.92	pCi/g dry		1/26/00 16:35
A9PI-P-5-6	30"-36"	THORIUM 232	1.4	0.69	pCi/g dry		1/26/00 16:35
A9PI-P-6-1	0"-6"	THORIUM 232	1.4	1	pCi/g dry		1/26/00 16:43
A9PI-P-6-2	6"-12"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 16:43
A9PI-P-6-3	12"-18"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 16:43
A9PI-P-6-4	18"-24"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 16:43
A9PI-P-6-5	24"-30"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 16:43
A9PI-P-6-6	30"-36"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 16:43
A9PI-P-7-1	0"-6"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 16:21
A9PI-P-7-2	6"-12"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 16:21
A9PI-P-7-3	12"-18"	THORIUM 232	1.4	1.3	pCi/g dry		1/26/00 16:21
A9PI-P-7-4	18"-24"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 16:21
A9PI-P-7-5	24"-30"	THORIUM 232	1.4	0.94	pCi/g dry		1/26/00 16:21
A9PI-P-7-6	30"-36"	THORIUM 232	1.4	0.77	pCi/g dry		1/26/00 16:21
A9PI-P-8-1	0"-6"	THORIUM 232	1.4	0.98	pCi/g dry		1/26/00 15:35
A9PI-P-8-2	6"-12"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 15:35

TABLE A-1
A9PI PRECERTIFICATION SEGMENTED BORINGS - ANALYTICAL RESULTS

SAMPLE ID	DEPTH	ANALYTE	FRL	RESULT	UNITS	AB QUA	DATE SAMPLED
A9PI-P-8-3	12"-18"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 15:35
A9PI-P-8-4	18"-24"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 15:35
A9PI-P-8-5	24"-30"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 15:35
A9PI-P-8-6	30"-36"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 15:35
A9PI-P-9-1	0"-6"	THORIUM 232	1.4	1	pCi/g dry		1/26/00 15:18
A9PI-P-9-2	6"-12"	THORIUM 232	1.4	1.2	pCi/g dry		1/26/00 15:18
A9PI-P-9-3	12"-18"	THORIUM 232	1.4	1.3	pCi/g dry		1/26/00 15:18
A9PI-P-9-4	18"-24"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 15:18
A9PI-P-9-5	24"-30"	THORIUM 232	1.4	1.1	pCi/g dry		1/26/00 15:18
A9PI-P-9-6	30"-36"	THORIUM 232	1.4	1	pCi/g dry		1/26/00 15:18
A9PI-P-1-1	0"-6"	URANIUM, TOTAL	50	9.1	ug/g dry		1/31/00 14:55
A9PI-P-1-2	6"-12"	URANIUM, TOTAL	50	9	ug/g dry		1/26/00 14:43
A9PI-P-1-3	12"-18"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 14:43
A9PI-P-1-4	18"-24"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 14:43
A9PI-P-1-5	24"-30"	URANIUM, TOTAL	50	8.4	ug/g dry	U	1/26/00 14:43
A9PI-P-1-6	30"-36"	URANIUM, TOTAL	50	1.6	ug/g dry	U	1/26/00 14:43
A9PI-P-2-1	0"-6"	URANIUM, TOTAL	50	8.9	ug/g dry		1/26/00 15:03
A9PI-P-2-2	6"-12"	URANIUM, TOTAL	50	6.5	ug/g dry		1/26/00 15:03
A9PI-P-2-3	12"-18"	URANIUM, TOTAL	50	5.8	ug/g dry		1/26/00 15:03
A9PI-P-2-4	18"-24"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 15:03
A9PI-P-2-5	24"-30"	URANIUM, TOTAL	50	2.2	ug/g dry	U	1/26/00 15:03
A9PI-P-2-6	30"-36"	URANIUM, TOTAL	50	4.1	ug/g dry		1/26/00 15:03
A9PI-P-3-1	0"-6"	URANIUM, TOTAL	50	13	ug/g dry		1/26/00 15:49
A9PI-P-3-2	6"-12"	URANIUM, TOTAL	50	11	ug/g dry		1/26/00 15:49
A9PI-P-3-3	12"-18"	URANIUM, TOTAL	50	2.9	ug/g dry		1/26/00 15:49
A9PI-P-3-4	18"-24"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 15:49
A9PI-P-3-5	24"-30"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 15:49
A9PI-P-3-6	30"-36"	URANIUM, TOTAL	50	5	ug/g dry		1/26/00 15:49
A9PI-P-4-1	0"-6"	URANIUM, TOTAL	50	14	ug/g dry		1/26/00 16:10
A9PI-P-4-2	6"-12"	URANIUM, TOTAL	50	5	ug/g dry		1/26/00 16:10
A9PI-P-4-3	12"-18"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 16:10
A9PI-P-4-4	18"-24"	URANIUM, TOTAL	50	2.2	ug/g dry	U	1/26/00 16:10
A9PI-P-4-5	24"-30"	URANIUM, TOTAL	50	4	ug/g dry		1/26/00 16:10
A9PI-P-4-6	30"-36"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 16:10
A9PI-P-5-1	0"-6"	URANIUM, TOTAL	50	12	ug/g dry		1/26/00 16:35
A9PI-P-5-2	6"-12"	URANIUM, TOTAL	50	8.3	ug/g dry		1/26/00 16:35
A9PI-P-5-3	12"-18"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 16:35
A9PI-P-5-4	18"-24"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 16:35
A9PI-P-5-5	24"-30"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 16:35
A9PI-P-5-6	30"-36"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 16:35
A9PI-P-6-1	0"-6"	URANIUM, TOTAL	50	11	ug/g dry		1/26/00 16:43
A9PI-P-6-2	6"-12"	URANIUM, TOTAL	50	4.3	ug/g dry		1/26/00 16:43
A9PI-P-6-3	12"-18"	URANIUM, TOTAL	50	5.7	ug/g dry	U	1/26/00 16:43
A9PI-P-6-4	18"-24"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 16:43
A9PI-P-6-5	24"-30"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 16:43
A9PI-P-6-6	30"-36"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 16:43

TABLE A-1
A9PI PRECERTIFICATION SEGMENTED BORINGS - ANALYTICAL RESULTS

SAMPLE ID	DEPTH	ANALYTE	FRL	RESULT	UNITS	AB QUA	DATE SAMPLED
A9PI-P-7-1	0"-6"	URANIUM, TOTAL	50	12	ug/g dry		1/26/00 16:21
A9PI-P-7-2	6"-12"	URANIUM, TOTAL	50	3.7	ug/g dry		1/26/00 16:21
A9PI-P-7-3	12"-18"	URANIUM, TOTAL	50	3.1	ug/g dry		1/26/00 16:21
A9PI-P-7-4	18"-24"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 16:21
A9PI-P-7-5	24"-30"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 16:21
A9PI-P-7-6	30"-36"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 16:21
A9PI-P-8-1	0"-6"	URANIUM, TOTAL	50	9.1	ug/g dry		1/26/00 15:35
A9PI-P-8-2	6"-12"	URANIUM, TOTAL	50	7.3	ug/g dry		1/26/00 15:35
A9PI-P-8-3	12"-18"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 15:35
A9PI-P-8-4	18"-24"	URANIUM, TOTAL	50	3.4	ug/g dry		1/26/00 15:35
A9PI-P-8-5	24"-30"	URANIUM, TOTAL	50	4.4	ug/g dry		1/26/00 15:35
A9PI-P-8-6	30"-36"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 15:35
A9PI-P-9-1	0"-6"	URANIUM, TOTAL	50	10	ug/g dry		1/26/00 15:18
A9PI-P-9-2	6"-12"	URANIUM, TOTAL	50	4	ug/g dry		1/26/00 15:18
A9PI-P-9-3	12"-18"	URANIUM, TOTAL	50	3.5	ug/g dry		1/26/00 15:18
A9PI-P-9-4	18"-24"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 15:18
A9PI-P-9-5	24"-30"	URANIUM, TOTAL	50	0	ug/g dry	U	1/26/00 15:18
A9PI-P-9-6	30"-36"	URANIUM, TOTAL	50	5.1	ug/g dry		1/26/00 15:18

Figure A-1. A9PI Arsenic Concentrations by Boring

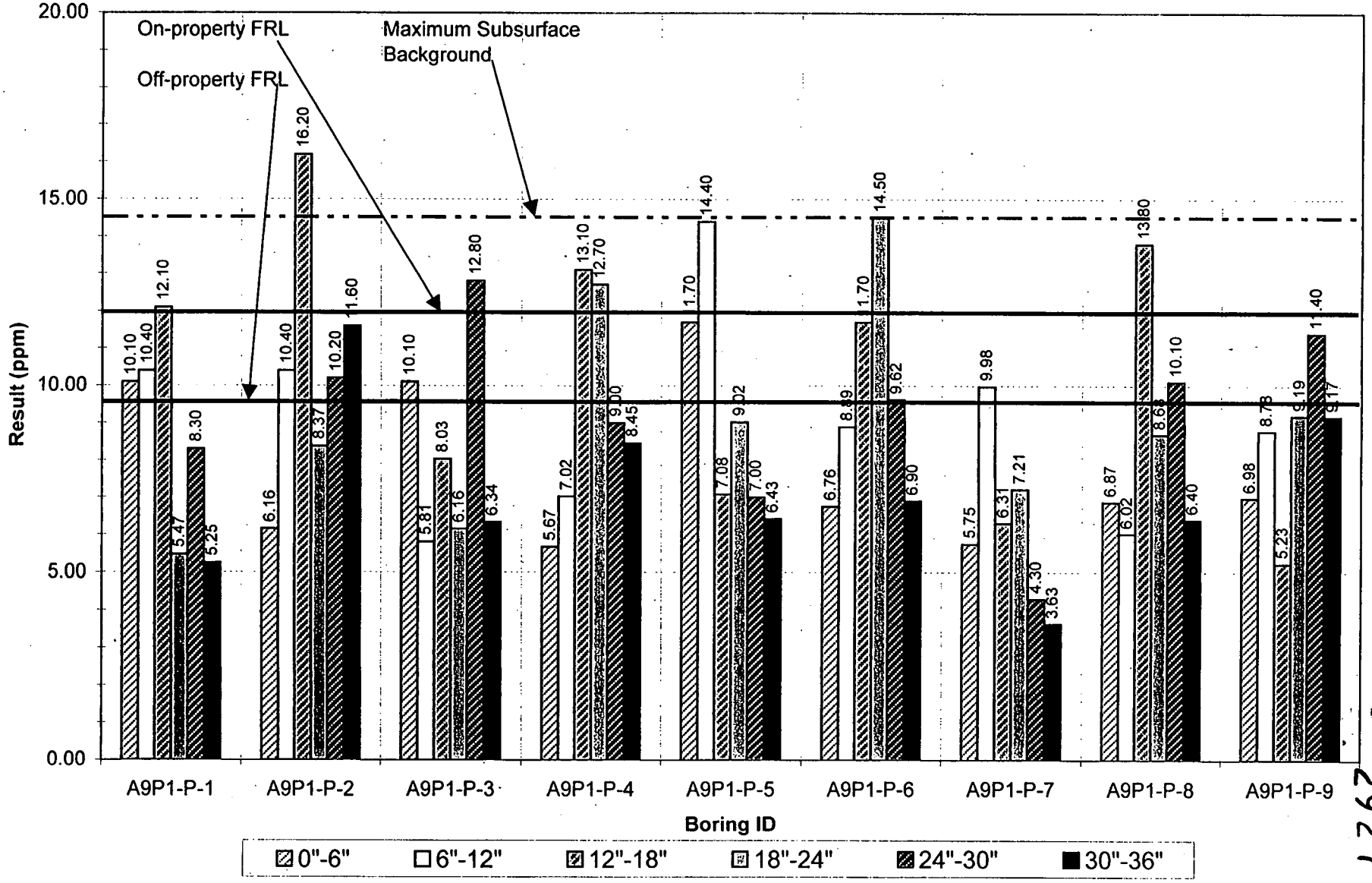

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Figure A-2. A9PI Arsenic Concentrations by Depth

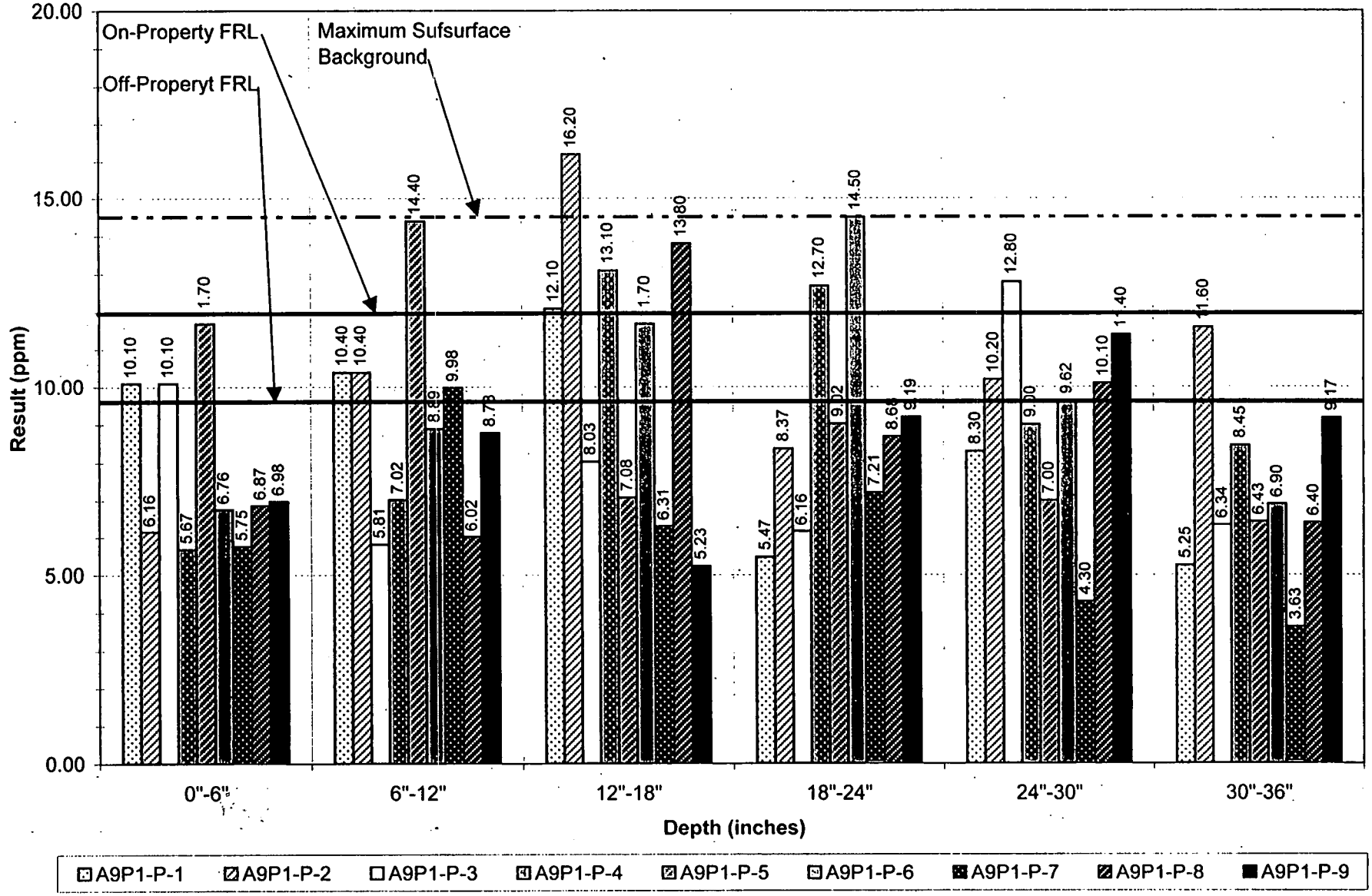

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Figure A-3. A9PI Beryllium Concentrations at Each Boring

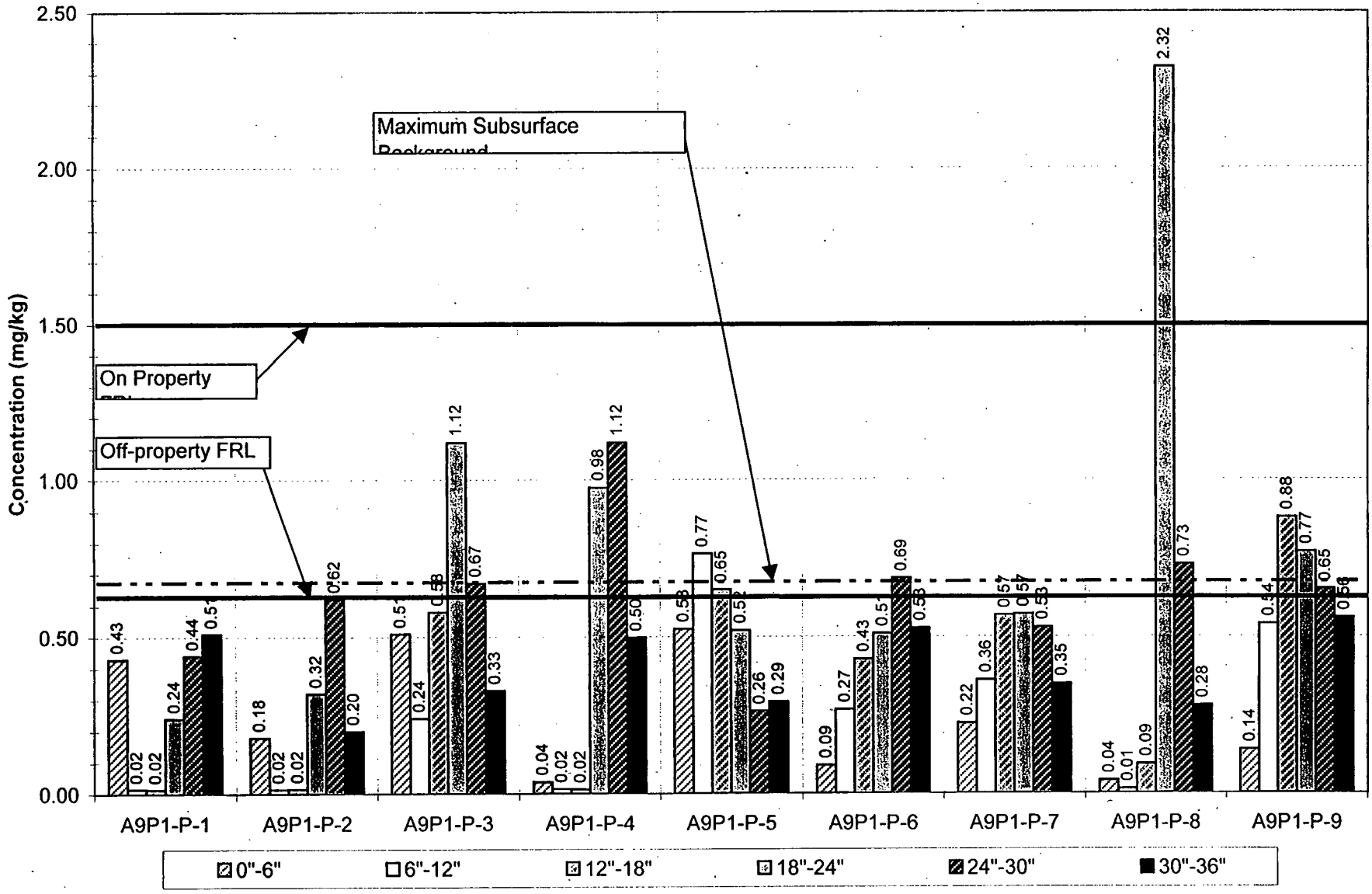

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Figure A-4. A9PI Beryllium Concentrations by Depth

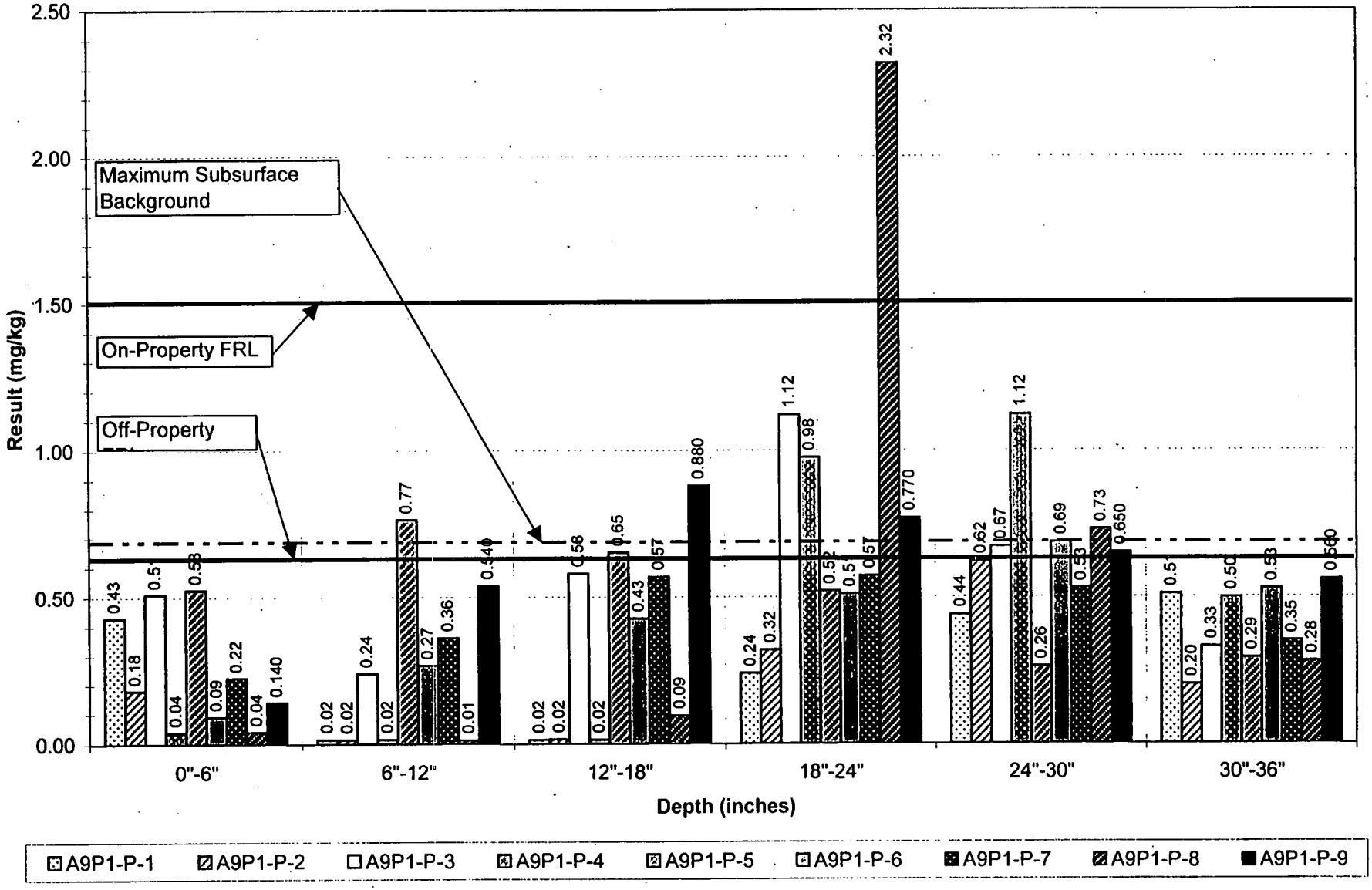

Figure A-5. A9PI Total Uranium Concentrations by Boring

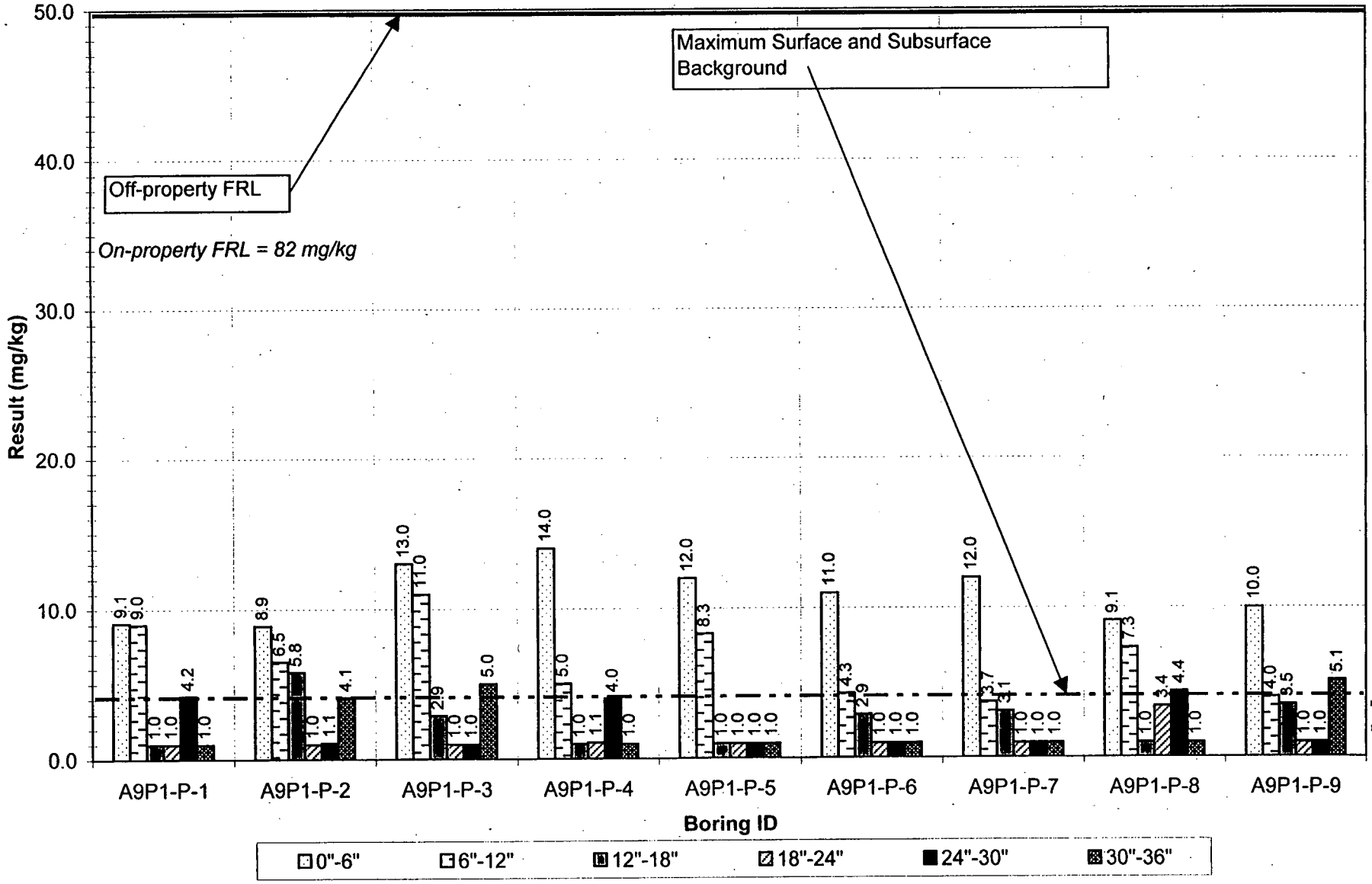

Figure A-6. A9PI Total Uranium Concentrations by Depth

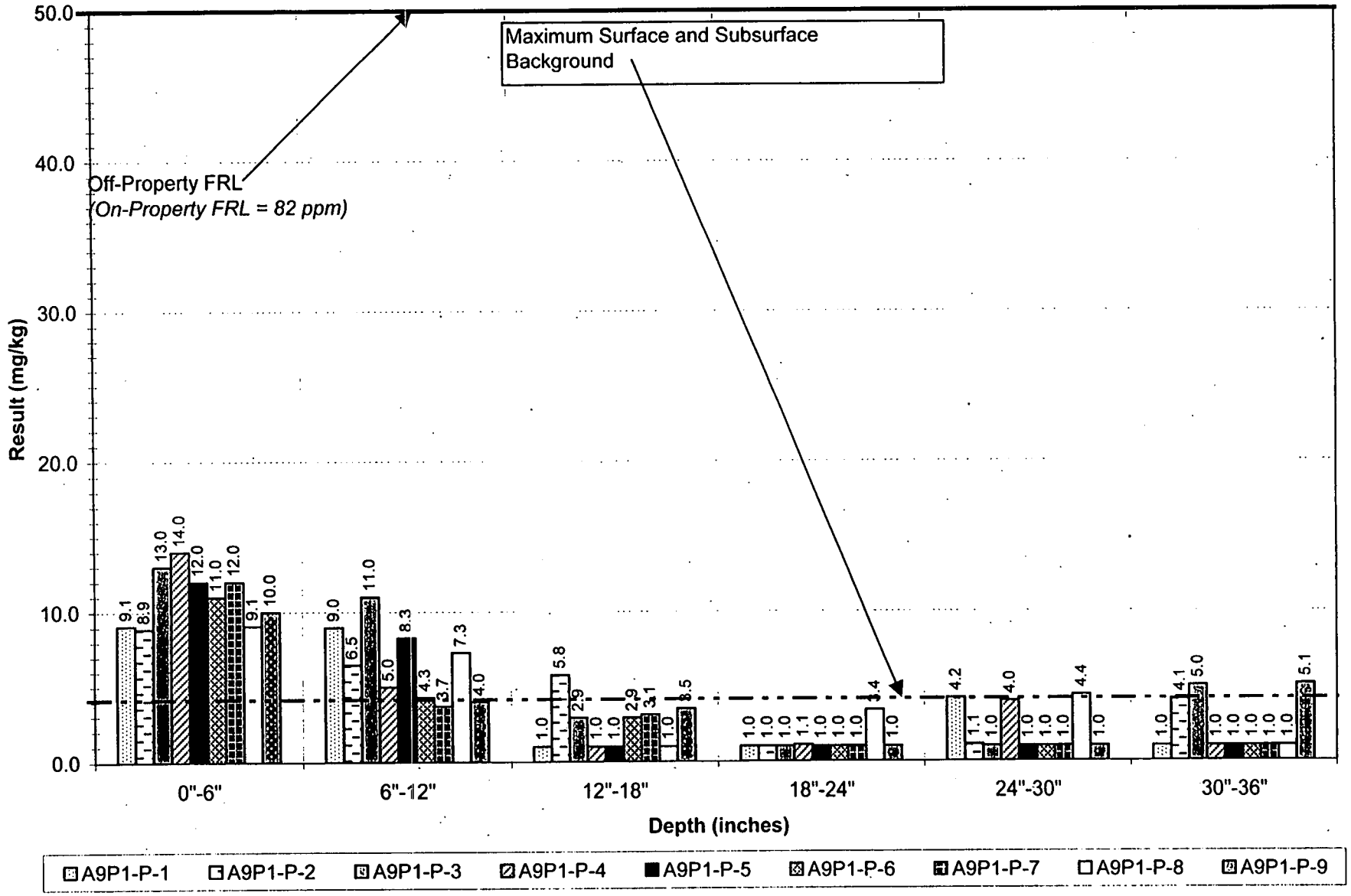

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Figure A-7. A9PI Radium-226 Concentrations by Boring

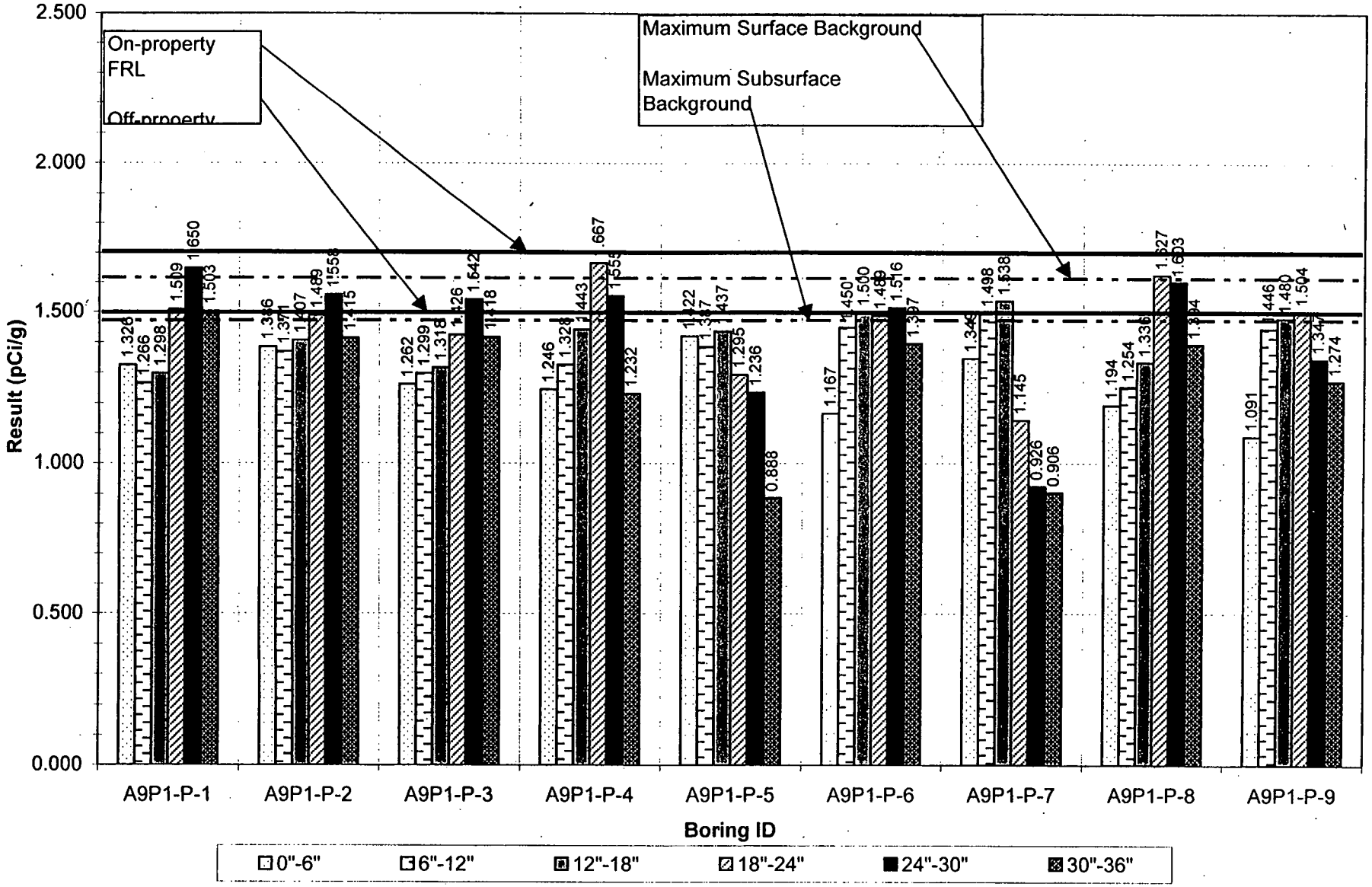

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Figure A-8. A9PI Radium-226 Concentrations by Depth

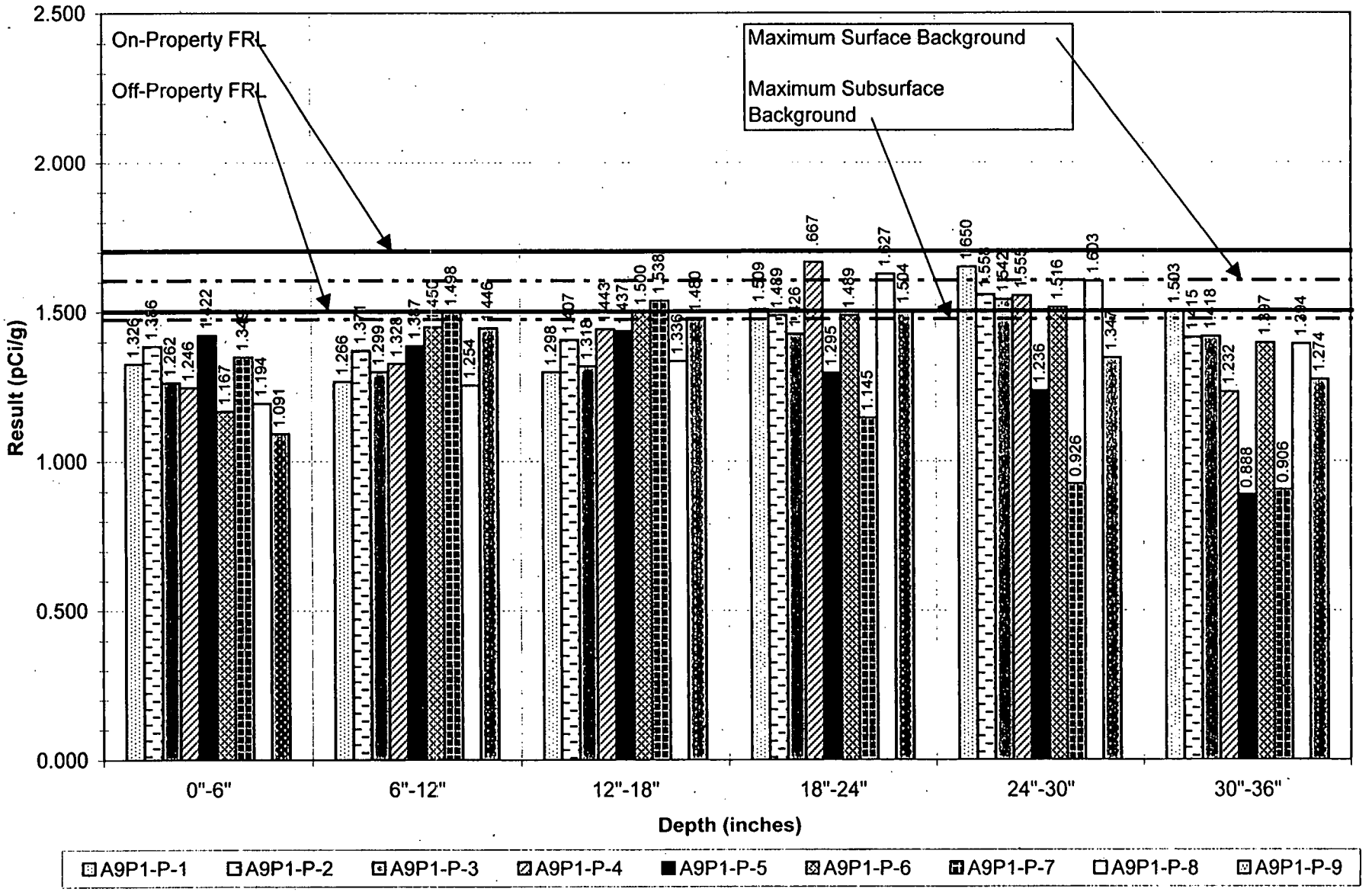

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Figure A-9. A9PI Thorium-232 Concentrations by Boring

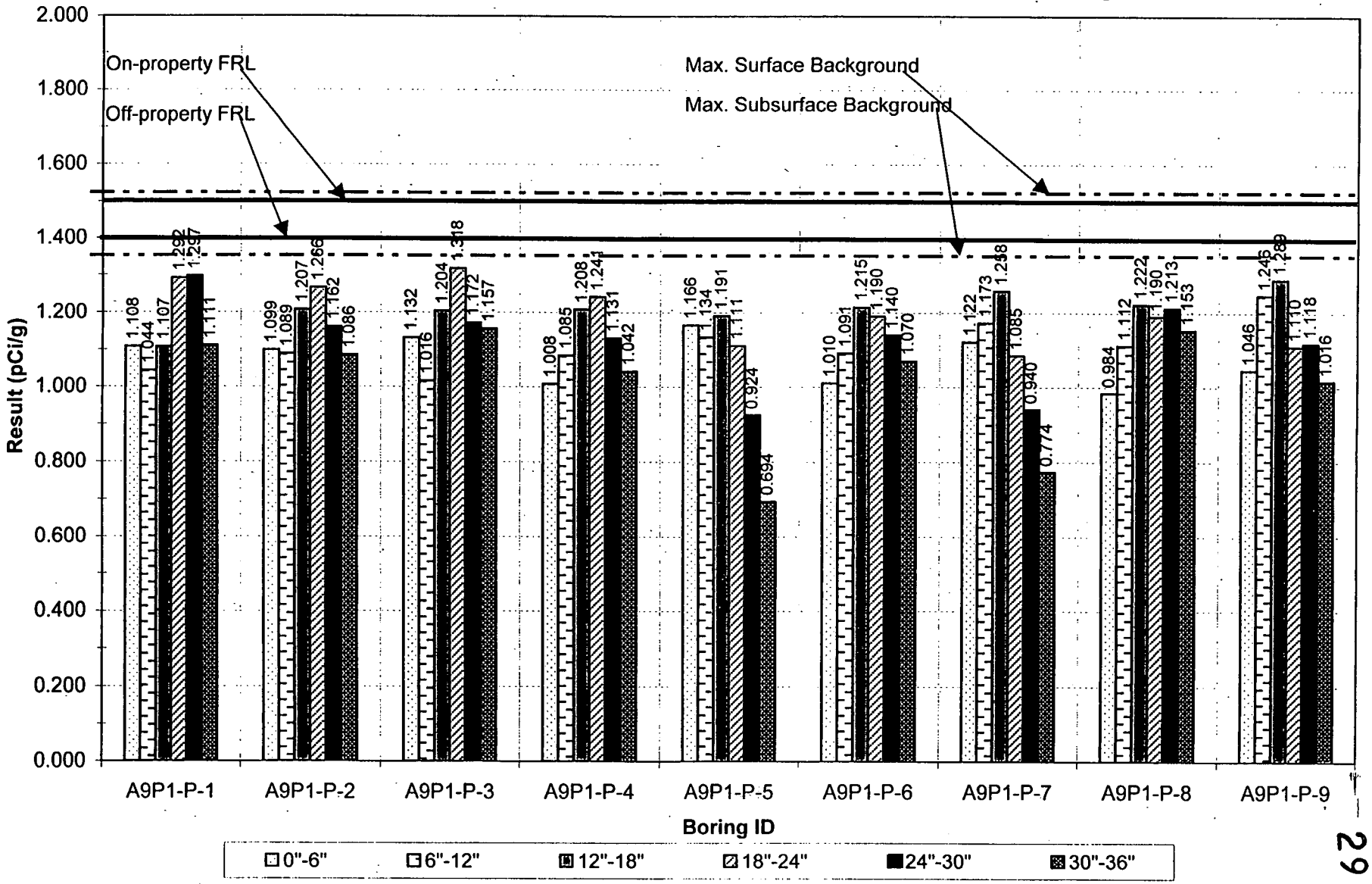
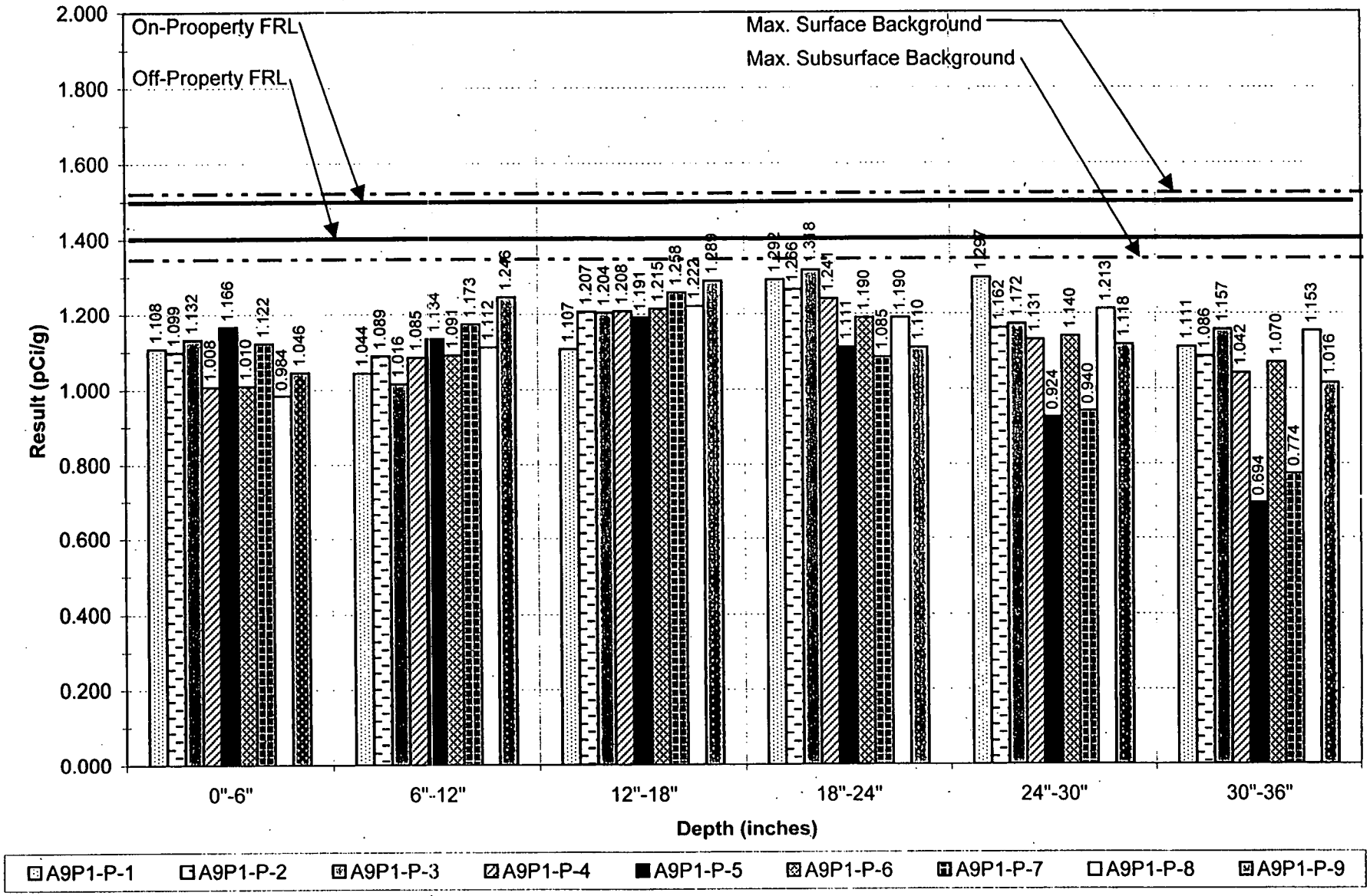


Figure A-10. A9PI Thorium-232 Concentrations by Depth



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APPENDIX B

AREA 9, PHASE I PRECERTIFICATION REAL-TIME DATA MAPS

APPENDIX B
AREA 9, PHASE I PRECERTIFICATION REAL-TIME DATA MAPS

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TABLE B-1
A9PI PRECERTIFICATION DATA
HPGe Readings with Results Above the FRL vs. Confirmation Physical Sample Results

HPGe ID	Sample ID	Northing	Easting	Analyte	HPGe Result	Lab Result	Unit
A9P1-P1-60-3-G	A9PI-P-CONF-1	484222.5	1352461.9	Total Uranium	12.2	10.395	pCi/g
				Radium-226	**1.853**	1.192	pCi/g
				Radium-228	-	1.057	pCi/g
				Thorium-228	-	1.032	pCi/g
				Thorium-232	1.07	1.057	pCi/g
A9P1-P1-61-3-G	A9PI-P-CONF-2	484150.8	1352490.6	Total Uranium	14.8	8.511	pCi/g
				Radium-226	**1.677**	1.243	pCi/g
				Radium-228	-	1.118	pCi/g
				Thorium-228	-	1.111	pCi/g
				Thorium-232	1.04	1.118	pCi/g
A9P1-P1-61-2-G	A9PI-P-CONF-3	484183.7	1352492.1	Total Uranium	9.67	6.463	pCi/g
				Radium-226	**1.649**	1.349	pCi/g
				Radium-228	-	1.044	pCi/g
				Thorium-228	-	1.028	pCi/g
				Thorium-232	0.972	1.044	pCi/g
A9P1-P1-60-1-G	A9PI-P-CONF-4	484244.5	1352422	Total Uranium	13.4	8.39	pCi/g
				Radium-226	**1.623**	1.122	pCi/g
				Radium-228	-	0.961	pCi/g
				Thorium-228	-	0.9	pCi/g
				Thorium-232	1.07	0.961	pCi/g
A9P1-P1-56-20-G	A9PI-P-CONF-5	484034.5	1352307.2	Total Uranium	17.5	10.002	pCi/g
				Radium-226	**1.553**	1.355	pCi/g
				Radium-228	-	1.197	pCi/g
				Thorium-228	-	1.176	pCi/g
				Thorium-232	1.09	1.197	pCi/g
A9P1-P1-56-1-G-D	A9PI-P-CONF-6	483940.7	1352374.2	Total Uranium	13.7	5.934	pCi/g
				Radium-226	**1.547**	0.866	pCi/g
				Radium-228	-	0.789	pCi/g
				Thorium-228	-	0.781	pCi/g
				Thorium-232	0.901	0.789	pCi/g
A9P1-P1-61-1-G	A9PI-P-CONF-7	484218.8	1352491.4	Total Uranium	11.4	8.713	pCi/g
				Radium-226	**1.503**	1.179	pCi/g
				Radium-228	-	1.034	pCi/g
				Thorium-228	-	1.013	pCi/g
				Thorium-232	1.03	1.034	pCi/g

* Results exceeding the FRL are shown in **bold**

Figure B-1 Area 9, Phase I

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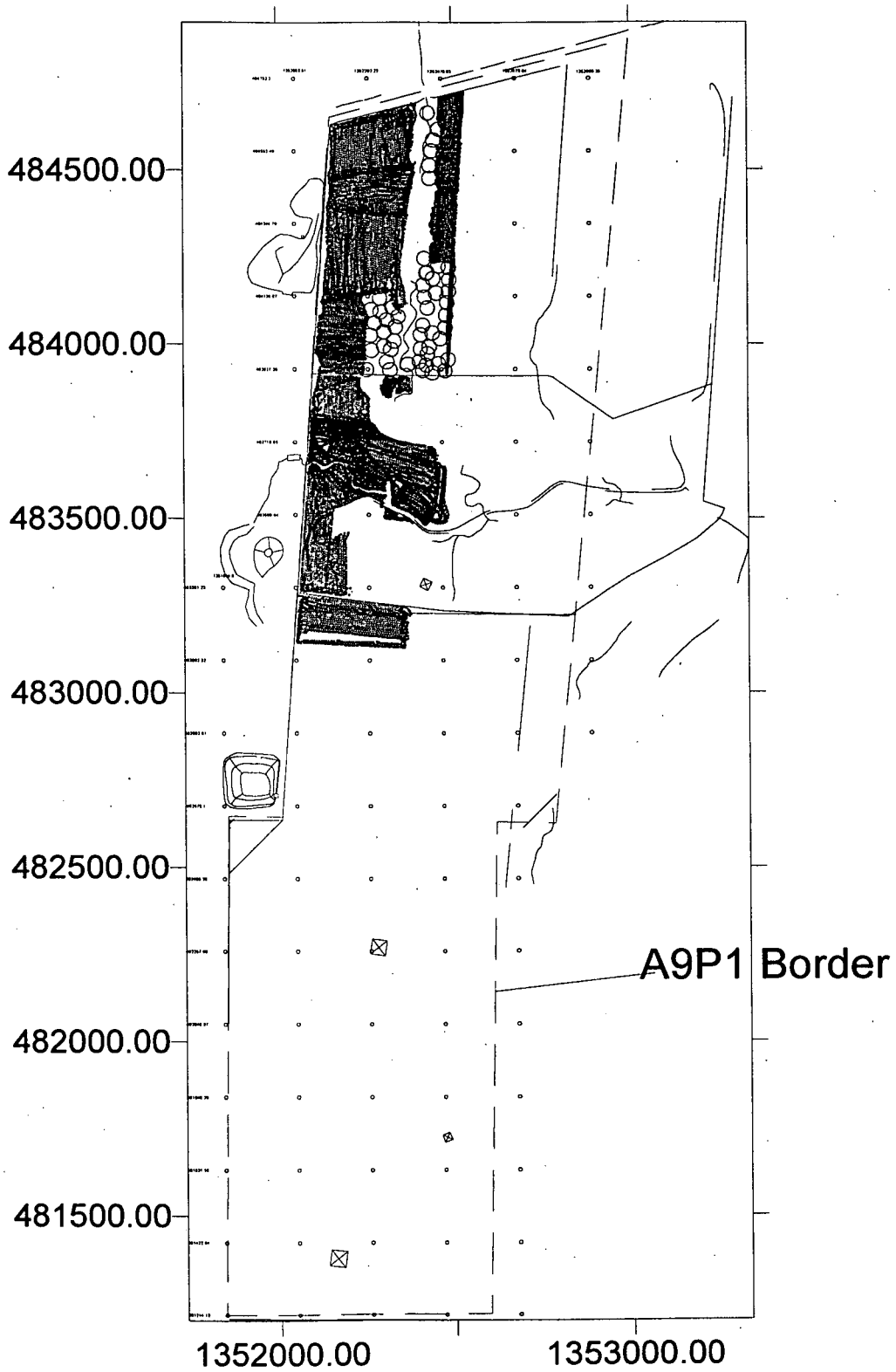
Total Gross Counts per Second



RMS
Total Gross CPS
- 0.00 to 2000.00
- 2000.00 to 2500.00
- 2500.00 to 3000.00
- 3000.00 to 4000.00

HPGe shown for coverage only

HPGe
Total Gross CPS
- 0.00 to 100.00

Figure B-2 Area 9 Phase I, Northern Section

Moisture Corrected Total Uranium

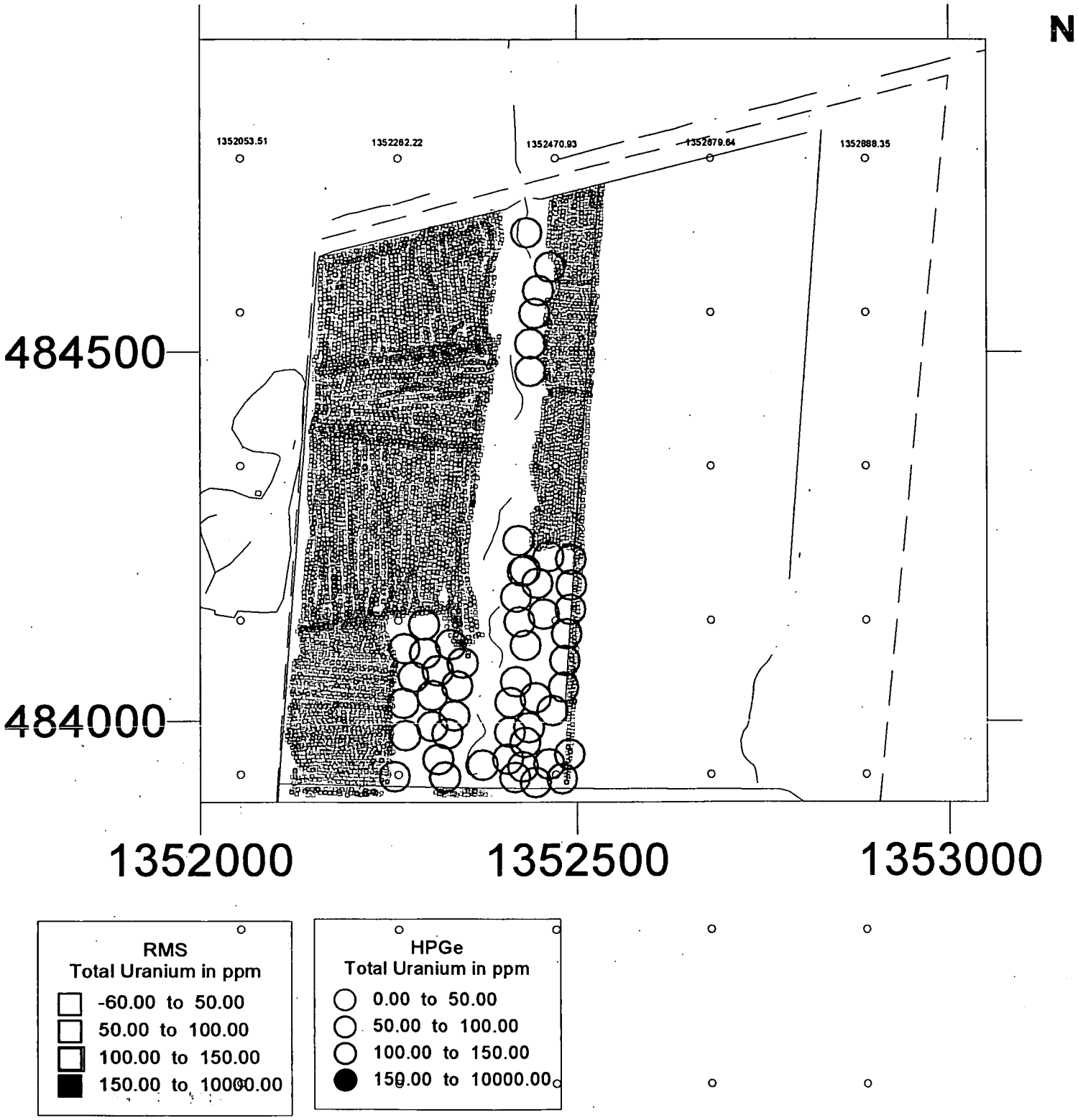


Figure B-3 Area 9 Phase I, Central Section

Figure B-4 Area 9 Phase I, Northern Section

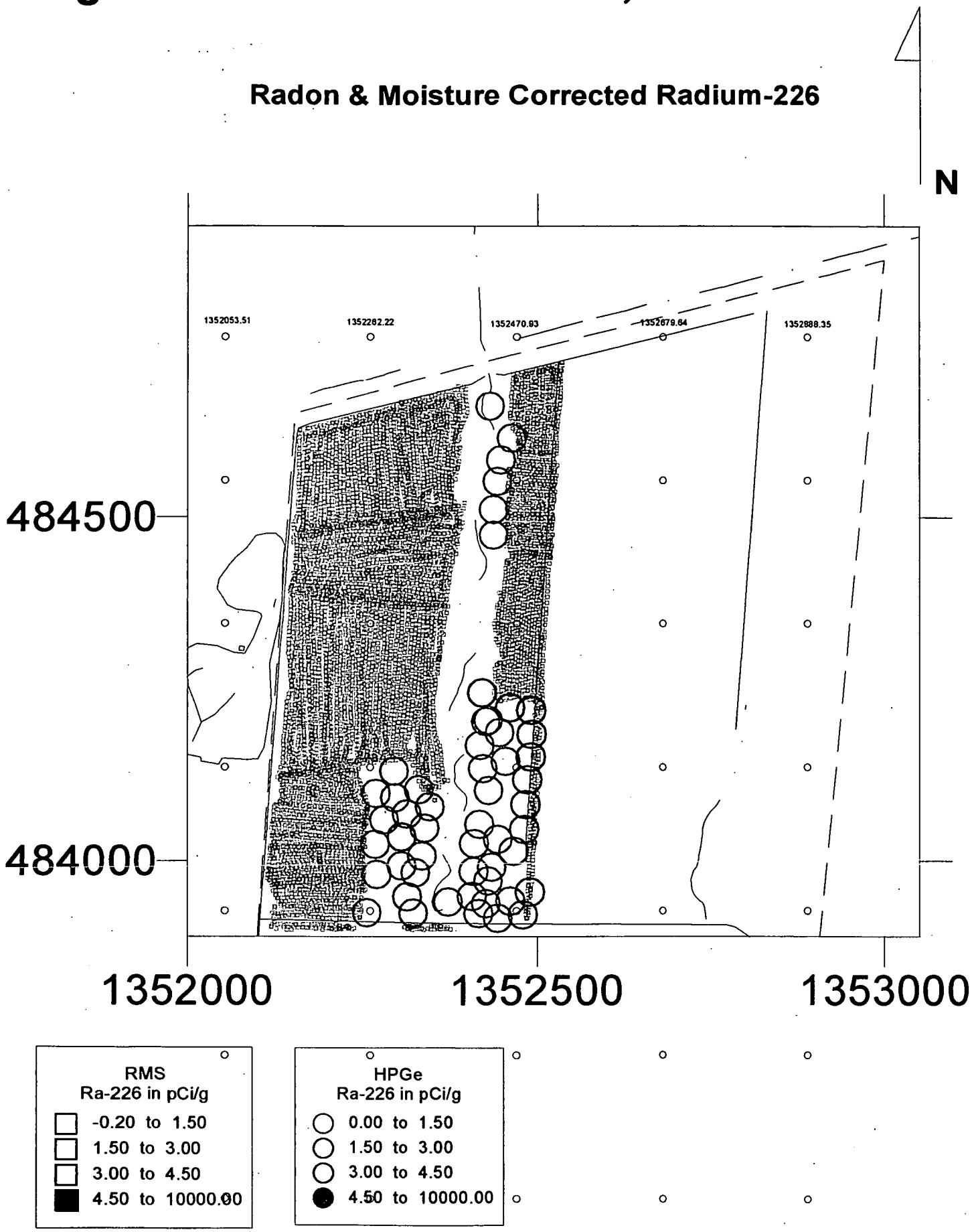


Figure B-5. Area 9 Phase I, Central Section

Radon & Moisture Corrected Radium-226

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RMS Ra-226 in pCi/g	HPGe Ra-226 in pCi/g
-0.20 to 1.50	0.00 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

Figure B-6 Area 9 Phase I, Northern Section

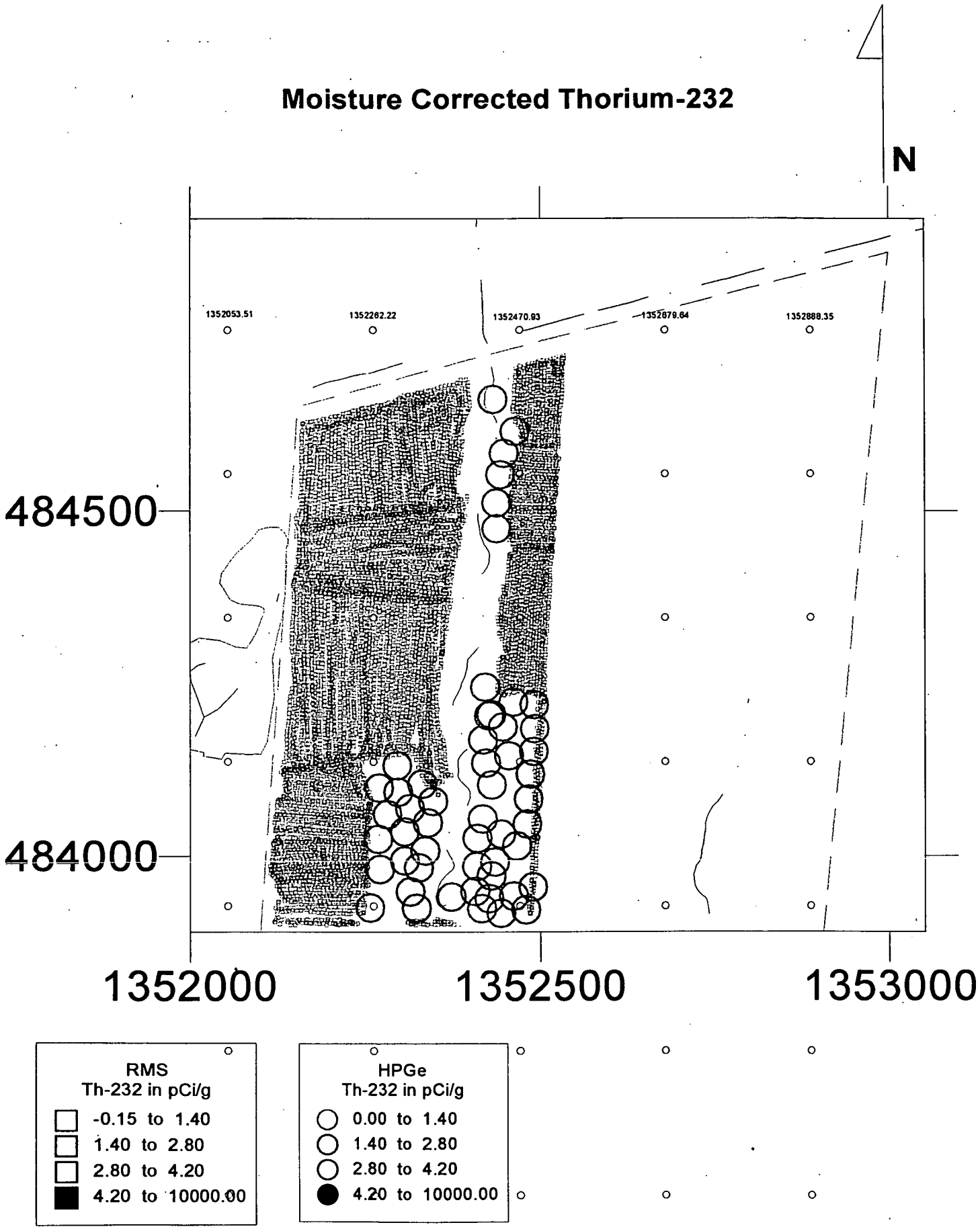

Figure B-7 Area 9 Phase I, Central Section

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Moisture Corrected Thorium-232