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# PROJECT SPECIFIC PLAN
# FOR CONDUCTING DIRECT-PUSH SAMPLING
# IN THE FORMER INACTIVE FLYASH PILE / SOUTH FIELD AREA

**PROJECT NUMBER 52462-PSP-001**

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**Prepared by**

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**Prepared for**

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**Fernald Field Office**

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# 1.0 INTRODUCTION

Direct-push groundwater sampling in the Great Miami Aquifer will be conducted in the area of the former Inactive Flyash Pile/South Field for the purpose of supporting pre-design of the South Field (Phase II) Aquifer Restoration Module. The objective of the sampling is to characterize the lateral and vertical extent of the uranium plume present in the aquifer in this area.

Direct-push sampling will target four different areas: 1) The former inactive flyash pile area, 2) The area west of Monitoring Wells 2068/3068, 3) The area between Extraction Wells 31563 and 31564. Each area is discussed below, and 4) The area east of the center and western chambers of the Storm Water Retention Basin.

The Former Inactive Flyash Pile Area

RI/FS characterization identified a uranium plume beneath the former Inactive Flyash Pile with a concentration ranging up to 2 ppm, as measured in Monitoring Well 2945. Characterization during the RI/FS was limited to a few well locations with fixed vertical screen depths, thus vertical concentration information concerning the plume is limited. Based on information collected around the Former Inactive Flyash Pile, this plume is believed to be oriented in a roughly east-west direction.

The first three direct push locations (12814, 12815, and 12816) will be used to establish the vertical, and roughly north-south lateral extent of the 20 µg/L uranium plume in the area of Monitoring Well 2945. The first location sampled (12814) will be located immediately east of the deepest soil excavation. The next two locations (12815 and 12816) will be located north and southeast of location 12814 respectively. Figure 1 shows the location of Monitoring Well 2945, the projected maximum extent of the uranium plume in the area (as reported for the second quarter of 2000), the location of the deepest soil excavation, and direct-push locations 12814, 12815, and 12816.

Additional direct push locations will be located and sampled pending the data received from locations 12814, 12815, and 12816. It is anticipated that additional direct push sampling will be needed both west and east of the three locations identified in Figure 1 to identify the lateral extent of the 20 µg/L uranium plume. Once an additional location has been identified, it will be uniquely numbered, surveyed, and then sampled as outlined in this PSP.

The area west of Monitoring Well 3068

The uranium plume in this area has changed since locations for extraction/injection wells in the South Field area were selected in the Baseline Remedial Strategy Report. The uranium concentration of the groundwater sampled from Monitoring Well 3068 has recently increased to a level above the groundwater FRL. The direction of groundwater flow in this area is from the west, implying that the source of the uranium contamination also lies to the west. Direct-push sampling will be conducted at Location 12817, which is located west of Well 3068, to determine the source of the uranium contamination. Additional direct push sampling locations may be located and sampled pending data received from Location 12817. It is anticipated that additional sampling will be necessary. Once an additional location has been identified, it will be uniquely numbered, surveyed, and then sampled as outlined in this PSP.

The area between Extraction Wells 31563 and 31564

An additional extraction well was planned for this area in the Baseline Remedial Strategy Report. Direct-push sampling is required to determine if the need for an additional extraction well still exists. Direct-push sampling will be conducted at Location 12818, which is located approximately half way between Extraction Wells 31563 and 31564, and at the approximate location identified in the Baseline Remedial Strategy Report for the additional extraction well. Additional direct push sampling locations may be located and sampled pending data received from Location 12818. If the need for an additional location is identified, they will be uniquely numbered, surveyed, and then sampled as outlined in this PSP.

The area east of the Center and Western Chambers of the Storm Water Retention Basin

This area of the aquifer has never been sampled for uranium contamination. Two direct-push locations have been identified (12819 and 12820). Both locations are shown in Figure 1. Location 12819 is located east of the West Chamber and Location 12820 is located east of the Center Chamber. Additional direct push sampling locations may be located and sampled pending data received from these two locations. If the need for an additional location is identified, they will be uniquely numbered, surveyed, and then sampled as outlined in this PSP.

## 2.0 MANAGEMENT AND ORGANIZATION

Fluor Daniel Fernald (FDF) personnel will conduct all of the sampling and field activities defined in this PSP. Responsibilities of project personnel are provided below. The FDF ARWWP/ Hydrogeology Section Team Coach (Bill Hertel) is responsible for:

- Providing a technical lead for the oversight and programmatic direction of sampling activities and the interpretation of sampling data
- Establishing and maintaining the scope, schedule, and cost baseline

The FDF Environmental Monitoring/Soils and Miscellaneous Media Projects Section Team Coach (Tom Buhrlage) is responsible for:

- Safety walk downs of the work areas, ensuring personnel are trained to safety and technical requirements, procuring applicable work permits, and ensuring that safety and PSP requirements are being adhered to during field implementation.
- Managing and conducting direct-push sampling activities

The FDF ARWWP/Hydrogeology Section Technical Lead (Ken Broberg) is responsible for:

- Oversight and programmatic direction of sampling activities and the interpretation of sampling data
- Reporting to the FDF ARWWP/Hydrogeology Section Team Coach on the progress and findings of PSP activities

PSP personnel contacts are listed below.

### KEY PROJECT PERSONNEL

| CONTACT | NAME | PHONE |
|---|---|---|
| ARWWP/Hydrogeology Section Team Coach | Bill Hertel | 648-3894 |
| Environmental Monitoring Soils and Misc. Media Section | Tom Buhrlage | 648-4116 |
| ARWWP/Hydrogeology Section Technical Lead | Ken Broberg | 648-5824 |
| Laboratory | Audrey Hannum | 648-4943 |
| Quality Assurance | Scott Wheeler | 648-4949 |
| Health & Safety | Keith Lanning | 648-4333 |

# 3.0 DIRECT PUSH SAMPLING

Analysis of groundwater samples obtained with a direct-push sampling tool will be used to refine the horizontal extent and determine the vertical extent of the 20 µg/L total uranium plume at select locations. The direct-push sampling tool will be used to collect groundwater samples from different vertical depths within the aquifer, rather than at a fixed monitoring depth.

At each direct-push sampling location groundwater samples will be collected at the following depths below the water table: 1 foot, 10 feet, and at subsequent depth intervals of 10 feet until it can be verified that the entire vertical thickness of the 20 µg/L total uranium plume has been sampled. Groundwater samples will be analyzed for both filtered and unfiltered total uranium.

## 3.1 SURVEYING AND STAKING DIRECT PUSH SAMPLING LOCATIONS

The ground elevation and location of each direct-push sampling location will be surveyed. A survey stake will be driven into the ground at each location and labeled. Field crews shall conform to the requirements stated in Procedure No. SH-0018, *Penetration Permits*, Rev. 2 PCN 1, March 8, 1999, (or future revisions) prior to penetrating the ground surface beyond 6 inches at each sampling location. The corresponding direct-push sampling location number for the sampling location will be written on the survey stake. A unique number will identify each direct-push sampling location.

## 3.2 DIRECT PUSH REQUIREMENTS

Field crews shall conform to the requirements stated in Procedure No. SH-0018, *Penetration Permits*, dated March 8, 1999, (or future revisions) prior to penetrating the ground surface. Collection of groundwater samples using a direct push-sampling tool is described in Data Quality Objective GW-030.

A Geoprobe™ mill-slotted sampler will be used to collect groundwater samples using direct push techniques as outlined in EQT-06, *Geoprobe Model 5400-Operation and Maintenance*. The slot size of the sampler will be 0.02 inches and the length of the slotted section will be 2 feet. The well point will be advanced with either 1.0 or 1.25-inch Outside Diameter (OD) probe rods. Samples will be collected through 3/8 or ½-inch OD polyethylene tubing equipped with a foot valve (ball check valve). New tubing will be used at each sampling depth for sample collection. The middle of the mill-slotted screen in the push rods will be positioned at the desired sampling depth.

For planning purposes, estimated ground surface elevations and depths to water for the first three direct-push sampling location are provided in Table 3-2. Table 3-3 is a copy of a Geoprobe™ Aquifer Sampling Depth Form. A unique Geoprobe™ Aquifer Sampling Depth Form will be prepared for each direct-push sampling event as discussed below.

- Location number will identify the sampling location on the Aquifer Sampling Depth Form.

- The surveyed surface elevation of the direct-push hole (see Section 3.1) will be recorded on the Geoprobe™ Aquifer Sampling Depth Form.

- The depth to water will be measured using a water level indicator to the nearest 0.1 feet. The depth to water will be recorded on the Geoprobe™ Aquifer Sampling Depth Form.

- A groundwater sample will be collected from a depth of 1 foot below the water table. If water is not collectible at 1 foot below the water table, then the sampler screen will be positioned 2 or 3 feet below the water table for the first depth sample.

- The direct-push rods will be advanced to a depth that will position the middle of the sampling screen at the required sampling depth of 10 feet below the water table. The depth to water will be re-measured using a water level indicator. Past experience with direct-push sampling at the FEMP has shown that sometimes the water table within the direct-push hole has not totally stabilized when the first sample is collected (1 foot below water table), but will have stabilized by the time the second sample is collected. Record the second water level on the Geoprobe™ Aquifer Sampling Depth Form.

  Note: The sample at 10 feet below the water table may be collected first if there is a need to remove clay from the mill-slots of the sampler rod. Refer to the procedure outlined below.

- Using the water level measured when the sampling tool is at a depth of 10 feet below the water table, enter the sampling depth for the rest of the samples (e.g., 20 feet, 30 feet, 40 feet, 50 feet, 60 feet, 70 feet, 80 feet, and 90 feet below the water table) on the Geoprobe™ Aquifer Sampling Depth Form.

- Proceed with collecting groundwater samples at the rest of the sampling depths by positioning the middle of the sampling screen at the required sampling depths. If clay should enter the probe rods, the clay should be removed through the addition of water into the probe rods above the clay as well as advancing the rods 10 feet below the water table to loosen the compacted clay in the rods. The procedure that will be followed is outlined below.

- Using 0.5-inch OD polyethylene tubing, push the tubing into the rods and attempt to force the clay up into the tubing.

- Add up to one liter of deionized water to the probe rods in 250-ml increments with surging following each addition. The surging should be performed with 3/8-inch polyethylene tubing with a ball check valve installed. The surging will convert the clay into a slurry that can be pumped to the surface by oscillating the tubing.

- In addition to the standard purge volume for 10 feet below the water table (bwt), (0.6 liters), collect five times the volume of water added to the probe rods prior to collecting the 10 feet bwt sample.

- Following collection of the 10 feet bwt sample, raise the probe rods to the 1 foot bwt depth for sample collection. A total of one liter of water should be purged from 1 foot bwt prior to sample collection to ensure a representative sample is collected.

Water sampling will continue at depth increments of 10 feet until the lower limit of the 20 µg/L uranium plume has been located, or as directed by the ARWWP/Hydrogeology Section Technical Lead. If obstructions are encountered or equipment complications prevent the push rods from extending to desired depths, then a different method for obtaining the sample may need to be used. The ARWWP/Hydrogeology Section Team Coach will approve alternate methods.

## 3.3 GROUNDWATER SAMPLE COLLECTION

One probe rod volume of groundwater will be purged at each sampling depth prior to collecting groundwater samples. The push rods will be purged from near the top of the water column or as close to the top (within 10 feet) to ensure representative samples are collected. Groundwater samples will be collected from as close to the screened interval as possible, taking care to avoid any clogging within the sampling tube due to accumulated silt/sand that has entered the mill slots. The same polyethylene tubing used to collect the groundwater sample from a particular interval or a dedicated purge tube will be used to purge the next sample interval. Purge volumes are based on the sample's depth below the water table. Estimated purge volumes for both a 1.25-inch casing and a 1.0-inch casing are provided on the Geoprobe™ Aquifer Sampling Depth Form (Table 3-3).

All samples will be pre-filtered using a five-micron in-line filter attached to the discharge end of a peristaltic pump. These samples will be listed as unfiltered on the Chain-of-Custody and Geoprobe Groundwater Sample Collection Log. By definition, a filtered sample is filtered by a 0.45-micron filter. Both a filtered and an unfiltered groundwater sample will be collected for the analysis of total uranium. The unfiltered sample will be run through a five-micron filter only. The filtered sample will be run through both a five-micron filter and a 0.45-micron filter.

Table 3-1 lists the preservation requirement, holding time, optimum/minimum sample volumes, and container type that will be used to collect the water sample. Estimated preservative volumes are listed for both optimum and minimum volumes. Minimal preservative volumes should be used to obtain a pH of less than two in order to prevent dissolution of solids in the sample. If more than 1.5 times the amount of nitric acid specified in Table 3-1 is required for lowering the pH to <2, then the ARWWP technical lead will be contacted for direction. Analyses will be ASL B and samples will be analyzed onsite at the Uranium and Thorium Analysts (UTA) Lab.

Table 3-4 lists the required QA/QC samples to be collected. One rinsate sample for total uranium analysis shall be collected prior to the start of each probe hole location by rinsing a clean mill-slotted sampler rod. A duplicate unfiltered sample will be collected at each sampling location at a depth of 20 feet below the water table. This depth was selected as it is expected to be located within the total uranium plume.

## 3.4 PROBE HOLE PLUGGING

The probe rods used for groundwater sampling will be completely removed from the borehole and the aquifer material will be allowed to collapse naturally up to the water table. A clean set of probe rods will be installed back into the probe hole in preparation for grouting immediately following removal of the probe rods used for sampling. Each probe hole will be plugged with a sand interval followed by a bentonite slurry to the ground surface. The aquifer material will be allowed to collapse naturally up to the water table. After driving the probe rods to a depth of three feet above the water table, a 3-foot thick interval of clean silica sand will be placed into the base of the borehole above the water table. A bentonite slurry will be mixed to SCQ specifications (approximately 9.4 pounds per gallon) and pumped through the probe rods to the bottom of the rods as the rods are removed. Plugging the hole with bentonite slurry will begin 3 feet above the sand and continue to the ground surface. The EQT-06 procedure, *Geoprobe Model 5400 Operation and Maintenance*, will be followed for grout pump assembly and preparation of the grout mixture. For the grout pumping method, the procedure outlined in *Geoprobe Owner's Manual - GS-1000 Grout Machine/Operating Instructions* (Section C- Secondary Tool String-Grout Pull Cap) will be followed.

The volume of bentonite slurry used in the plugging process will be monitored and recorded on a Borehole Abandonment Record. The probe hole will be inspected two to three days following grouting

and, if necessary, bentonite pellets placed into the hole to the ground surface. In this event, the Borehole Abandonment Record will be revised with the additional volume information.

Grout volumes have been estimated for each direct-push location using preliminary survey elevations, depth to water elevations, and the following formula (Volume [gallons] = Depth to water level in feet multiplied by 0.13) assuming 1.25-inch rods are used and the final hole diameter is roughly 1.75 inches. It will be necessary to recalculate these volumes if the depth to water is significantly different than estimated in Table 3-2. The volume estimates for each direct-push location are as follows:

| | |
|---|---|
| 12814 | 4.1 gallons |
| 12815 | 5.1 gallons |
| 12816 | 4.0 gallons |
| 12817 | 8.0 gallons |
| 12818 | 4.0 gallons |
| 12819 | 7.0 gallons |
| 12820 | 7.0 gallons |

## 3.5 SAMPLE IDENTIFICATION

All groundwater samples collected for laboratory analysis will be assigned a unique sample identification number, also known as a Fernald Analytical Computerized Tracking System (FACTS) identification number. The FACTS number will identify the sampling location and depth (feet below the water table) at which the sample was collected. As an example, the sample identifier for a sample collected at location 12814 at a depth of 1 foot below the water table would be "12814-01." The sample identifier for a duplicate sample collected at a depth of 20 feet below the water table would be "12814-20-D."

A rinsate from each sampling location will be collected and identified using the location number and letter "X." The "X" designates it as a rinsate sample. For example, a rinsate from borehole 12814 will be identified as "12814-X." Duplicate filtered and unfiltered sample will be collected at each location from the depth of 20 feet below the water table. The duplicate samples will be analyzed for total uranium.

## 4.0 EQUIPMENT DECONTAMINATION

Probe rods and samplers will be decontaminated to Level I prior to initiating probing at the first location and between borehole locations using a high-pressure spray wash as per SMPL-02.

## 5.0 WASTE DISPOSAL

Small amounts of groundwater, decontamination water, and contact wastes will be generated during field activities. Any wastes generated will be managed per Project Waste Identification document (PWID) #552. The Waste Acceptance Organization (WAO) will be contacted for specific direction on a waste -stream by waste-stream basis.

## 6.0 HEALTH & SAFETY

Personnel shall conform to precautionary surveys performed by the personnel representing the Utility Engineer, Safety and Health, and Radiological Control. Concurrence to applicable safety permits (indicated by the signature of personnel assigned to this project) is expected from all project personnel in the performance of their assigned duties. The EM Team Coach will ensure that all EM personnel performing project-related activities have read or been trained to the EM sampling procedures applicable to this work. In addition to the applicable surveys that protect worker safety and health is an acknowledgment of understanding the PSP requirements and safety precautions outlined in the procedures and permits. A copy of applicable safety permits/surveys issued for worker safety and health shall be available for reference/review at each sample location, and at the completion of the project, the completed forms shall be submitted for incorporation into the project files.

## 7.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

### 7.1 PROJECT REQUIREMENTS FOR SURVEILLANCE

Self-assessment of work processes and operations may be undertaken to assure quality of performance. Self-assessment may be performed by the Environmental Monitoring/Soils and Miscellaneous Media Projects Team Coach, and will encompass technical and procedural requirements. Such self-assessment may be conducted at any point in the project.

Independent assessment may be performed by the FDF QA organization by conducting surveillances. At a minimum, surveillances and inspections will consist of an evaluation of the QA Program and procedures, verification that they have been effectively implemented, and a review of associated project documentation.

### 7.2 VARIANCES TO THE PROJECT SPECIFIC PLAN

Variances shall be performed and documented in accordance with the requirements of Section 15.3 of the SCQ. They shall be documented on the Variance/Field Change Notice (V/FCN) form, FD-F-4162. If the variance is time-critical the requirements of Section 15.3.1 shall be followed. This allows approval of the variance by hard copy, electronic mail, or fax with the original V/FCN to follow and be completed within five working days. Verbal approval is not allowed for variances; some form of documentation is required as stated in Section 15.3.1 of the SCQ. A location movement $< 10$ feet will not require a variance.

## 8.0 DATA MANAGEMENT

A data management process will be implemented so information collected during the direct-push activity will be properly managed following completion of the field activities. As specified in Section 5.1 of the SCQ, sampling teams will describe daily activities on the Field Activity Log with sufficient detail so that the sampling team can reconstruct a particular situation without reliance on memory. Sample Collection Logs will be completed according to instructions specified in Section 6.1 of the SCQ.

All field measurements, observations, and sample collection information will be recorded as required and applicable on the Sample Collection Log, the Field Activity Log, and the Chain of Custody/Request for Analysis Form, the Borehole Abandonment Record, and the Geoprobe Aquifer Sampling Depth Form. The method of sample collection will be specified in the Field Activity Log. A unique sample identification number will appear on the Chain of Custody/Request for Analysis and will be used to identify the sample during analysis, data entry, and data management.

Technicians will review all field data for completeness and accuracy and then forward the data package to the Data Quality organization for final review. The field data package will be filed in the records of the Environmental Monitoring project.

The Data Management organization will perform data entry into the Site-Wide Environmental Database. Field logs will be maintained in loose-leaf form during the field recording activities. Analytical data will be reviewed by the Project Lead prior to entry of transfer of the data into the SED from the FACTS database.

## TABLE 3-1

## GEOPROBE™ SAMPLING ANALYTICAL REQUIREMENTS (ASL B)

| Analyte | Lab [b] | Preservative [a] | Holding Time | Optimum Volume | Minimum Volume | Container | Approximate Detection Levels |
|---|---|---|---|---|---|---|---|
| Total Uranium | UTA [c] Lab | $HNO_3$ pH<2 2 drops/1 drop | 6 months | 50 ml | 20 ml | 120 ml plastic | 1 µg/L |

[a] Estimated preservative volumes listed for optimum and minimum sample volumes. $HNO_3$ is 70 percent, 16N. Refer to Table 1 in SMPL-02 procedure for other volume information on the $HNO_3$ preservatives. Each drop of acid contains approximately 0.05 ml.

[b] All samples to be analyzed at ASL B as per FEMP SCQ specifications and audit requirements.

[c] UTA stands for "Uranium-Thorium Analysis

## TABLE 3-2

## ESTIMATED SURFACE ELEVATIONS AND ESTIMATED DEPTH TO WATER TABLE FOR DIRECT-PUSH SAMPLING LOCATIONS 12814, 12815, AND 12816

| Sampling Location | Estimated Ground Surface Elevations (Feet amsl) | Estimated Depth to Water (Feet bgs) |
|---|---|---|
| 12814 | 547 | 32 |
| 12815 | 555 | 40 |
| 12816 | 544 | 29 |
| 12817 | 578 | 62 |
| 12818 | 545 | 28 |
| 12819 | 573 | 56 |
| 12820 | 573 | 56 |

## TABLE 3-3

## GEOPROBE™ AQUIFER SAMPLING DEPTH FORM

| Location | Surface Elevation | Depth to Water, First Measurement in feet | Depth to Water, Second Measurement in feet |
|---|---|---|---|
| | amsl[a] | bgs[b] | bgs |

| | Target Sampling Depth (feet bwt) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1' bwt[c] | 10' bwt | 20' bwt | 30' bwt | 40' bwt | 50' bwt | 60' bwt | 70' bwt | 80' bwt | 90' bwt |
| | Actual Sampling Depth (feet bgs) | | | | | | | | | |
| | bgs | bgs | bgs | bgs | bgs | bgs | bgs | bgs | bgs | bgs |
| Purge Volume[d] (Liters) 1.25-inch Casing | 0.13 | 0.62 | 1.3 | 1.9 | 2.5 | 3.0 | 3.6 | 4.2 | 4.8 | 5.5 |
| Purge Volume[d] Liters) 1.0-inch Casing | 0.08 | 0.4 | 0.8 | 1.2 | 1.6 | 1.9 | 2.3 | 2.7 | 3.1 | 3.5 |

[a]Note: amsl - above mean sea level
[b]bgs - below ground surface
[c]bwt - below water table
[d]Additional purge volume may be required if sample intervals were collected out of sequence or water was added to the probe rods (refer to Section 3.2).

## TABLE 3-4

## QA/QC SAMPLES, ANALYTICAL REQUIREMENTS

| QA/QC Sample | Analyte | Lab | Preservative[a] | Holding Time | Optimum Volume | Minimum Volume | Container |
|---|---|---|---|---|---|---|---|
| Rinsate | Total Uranium | UTA | $HNO_3$ pH<2 2 drops/1 drop | 6 month | 50 ml | 20 ml | 120 ml plastic |
| Field Duplicate | Total Uranium | UTA | $HNO_3$ pH<2 2 drops/1 drop | 6 month | 50 ml | 20 ml | 120 ml plastic |

[a]Estimated preservative volume listed for optimum and minimum sample volumes. $HNO_3$ is 70 percent, 16N. One rinsate sample shall be collected at each location. The rinsate will be collected by rinsing the mill-slotted sampling rod.

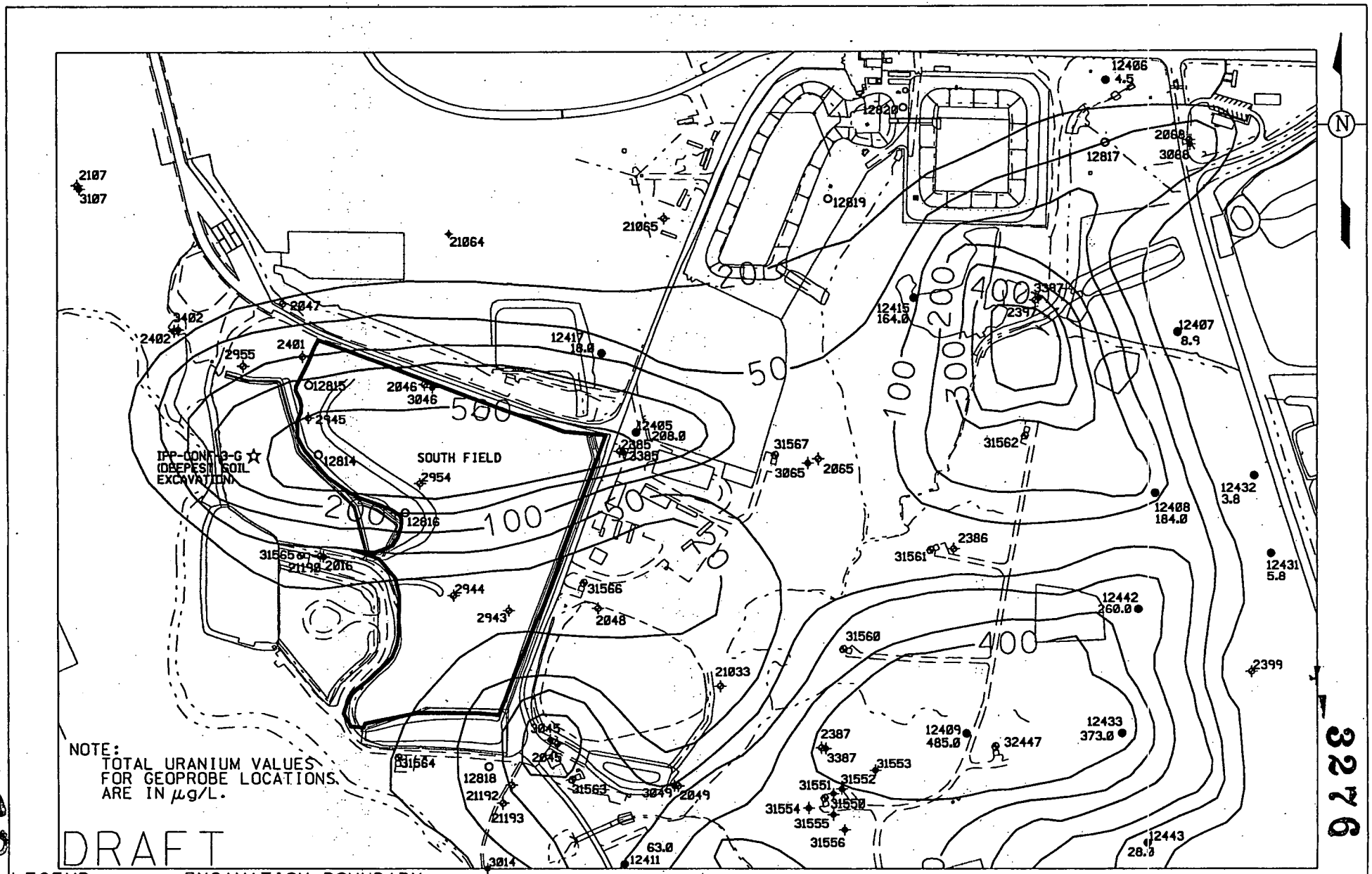


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FIGURE 1. LOCATION MAP

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