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**United States Department of Energy**

**Savannah River Site**

## **Scoping Summary for the P-Area Operable Unit (U)**

**ERD-EN-2005-0172**

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**KEY CHANGES TO SCOPING SUMMARY**

Date	Section	Description of Change
12 Mar. 2007	All	Document was revised to include summary of field characterization activities and preliminary data evaluations.
21 May, 2007	All	Document revised to support the FS Scoping Summary Meeting
	All	Additional characterization text changes that were requested by the Core Team are provided in the Supplemental Attachment.
	1.0	Editorial changes to reflect feasibility study scoping.
	5.0	Editorial changes to reflect feasibility study scoping.
	5.2.1	Revised Likely Response Actions. Deleted “excavation” because SRS historically has not carried forward as a response action. Added “Focused Reclamation (i.e., soil amendments, enhanced vegetation, etc.)”.
	5.2.2	Revised Problems Warranting Action to reflect the P007 outfall only.
		Revised Remedial Action Objectives to reflect only the P007 outfall.
		Because of design impracticability, deleted “cover” as a Likely Response Action. Revised uncertainty statements.
	5.4.2	Deleted all Likely Response Actions except for institutional controls, groundwater monitoring and SVE, which are presumptive remedies for this subunit (PSA-3B).
		Deleted uncertainty statement. Contaminant migration evaluation was reanalyzed and confirmed - a RGO was determined.
	5.5.3	Added “Cover” to the Likely Response Actions and clarified the “Select removal of process equipment”.
	5.5.5	Deleted uncertainty statement – residential risk was verified to be below 10E-6.
	5.5.6	Deleted “Subsurface Heating” and “Bioremediation” as Likely Response Actions.
	5.5.6	Deleted first uncertainty statement. Contaminant migration evaluation was reanalyzed and confirmed - RGO determined.
	5.6.1	Because of technical impracticability, deleted “Cover” as a Likely Response Action. Revised uncertainty statements.

RECORD OF KEY AGREEMENTS	
Date	Description of Agreement
2 Nov. 2005	The end state of the Reactor Building (105-P) will most likely be <i>in situ</i> decommissioning. The project team should evaluate the building as a consolidation unit.  The land use is non-residential and the industrial worker scenario will apply to risk assessments.
2 Dec. 2005	The core team agreed to a revised submittal date for the rev. 0 RI Work Plan for the PAOU until 3/2/2006. WSRC/DOE will submit an extension request for the new submittal date.
	The core team agreed to a phased Work Plan for the PAOU. This phased approach will include subsequent scoping associated with the process sewer lines and Reactor Building.
	The core team agreed to a standing meeting on the last Wednesday of each month as a way of communicating status and issues concerning the PAOU. The first call-in will be January 25, 2006.
	The core team agreed to submittal of a modified Area Closure RI Work Plan for P Area. It was also agreed that no modified table of contents will be submitted for review prior to submittal of the modified Work Plan.
27 March 2007	Core team agrees that radionuclides found in gravel (potassium-40, radium-226 (+D), radium-228 (+D), thorium-228 (+D), and uranium-235 (+D)) that occur naturally in source material (granite) exceed soil background concentrations and risk thresholds, and therefore, it is not necessary to carry them through the risk assessment.
	Core team agrees to evaluate PSA 1 soil data against residential risk to determine if the area can be identified as unrestricted release (does not include groundwater).
	Core team agrees to evaluate early actions at the HCA, PSA 3A, and PSA 3B. Discussion concerning implementation of early action(s) will be discussed in an upcoming FS scoping meeting.
	Core team agrees that sampling will be performed for confirmation to define extent of contamination at the P007 and P02 outfalls during remedial action.
	Core team agrees that P007 outfall should be separated out from the Ash Basin subunit and considered separately in terms of risk and remediation.

## **1.0 Project Phase**

This scoping summary supports development of the combined Remedial Investigation (RI)/Baseline Risk Assessment (BRA)/Feasibility Study (FS) for the P-Area Operable Unit (PAOU), or Combined document, which will be submitted on or before 09/28/2007.

The objective of this Feasibility Study scoping summary meeting is to agree on the likely response actions to be evaluated and developed as alternatives in the combined document and agree on the uncertainties identified and whether they have been adequately managed.

## **2.0 Background**

P Area is located in south-central Savannah River Site (SRS) (Figure 1). P-Area Reactor was started up in February 1954 and placed in shutdown in 1991. The primary sources of radioactive contamination in P Area are fission products and tritium, both of which were by-products of operation of the P-Reactor. In addition, solvents, which were used to clean fuel and targets and other equipment, are a source of non-radioactive contamination.

The PAOU comprises (1) Federal Facility Agreement (FFA) Operable Units (OUs), (2) the Reactor Building (105-P) and ancillary structures, (3) potential (vadose zone) source areas (PSAs) to the groundwater as identified during P-Area Reactor Groundwater (PRGW) OU pre-work plan characterizations, and (4) any other releases subsequently identified. Groundwater in P Area is not included in the PAOU. However, a limited groundwater investigation was performed to support identification of potential vadose zone source areas to be addressed as part of the PAOU. Figure 2 and Figure 3 illustrate the units that were investigated.

Field characterization activities were conducted during calendar year 2006 as outlined and described in Revision 1.1 RI Work Plan for the PAOU. This work entailed soil-gas, surface soil and gravel, subsurface soil, ash, and groundwater sampling within the five identified Investigative Units (IUs) to discern impact to the environment, risk to human health and ecological receptors, and to determine constituents that may exceed principal threat source material (PTSM) and contaminant migration screening trigger values (see Section 5.0) (Table 1).

Field characterization activities were scoped in March 2007. A total of 11 subunits from the IUs were investigated to define Problems Warranting Action and associated Remedial Action Objectives and Likely Response Actions. Seven subunits were defined with Problems Warranting Action.

## **3.0 Land Use**

Future industrial land use is expected and will be controlled in accordance with the SRS Land Use Control Assurance Plan. An industrial land use scenario is selected as the baseline risk assessment exposure scenario for the protection of human health and the environment. Accordingly, the response action(s) selected will ensure protection against unrestricted exposure.

*In-situ* decommissioning is anticipated for the Reactor Building (105-P) based on agreements with the FFA parties and is subject to completion of a CERCLA Record of Decision (ROD) for the selected end-state. Decisions regarding the details pertaining to this final action will be further discussed and scoped in subsequent core team meetings. There is no current or projected future use of the groundwater as a drinking water source.

#### **4.0 P-Area Operable Unit**

Based on process history and previous investigations that have been performed in and around P Area, a general understanding of the potential contaminants, contaminant sources, and contaminant behavior is known. This knowledge was developed from waste unit investigations (RCRA/CERCLA Operable Units [OUs]), the Site Evaluation (SE) Program investigations, reactor process documents, gamma over-flight surveys, and pre-Work Plan characterization for the P-Area Reactor Groundwater OU, and characterization for the PAOU.

To evaluate the impact to the environment from various former operating facilities and remaining Federal Facility Agreement (FFA) OUs at P Area, the identified OUs have been grouped into the three following categories: 1) FFA OUs; 2) PSAs; and 3) Deactivation and Decommissioning (D&D) Structures.

##### Federal Facility Agreement Operable Units

The FFA OUs characterized include the following:

- P-Area Ash Basin (188-0P);
- Potential Release from P-Area Reactor Water Cooling System (186/190-P);
- Potential Release from P-Area Disassembly Basin (105-P);
- P-Area Process Sewer Lines As Abandoned (NBN) (which includes the Spill on 03/15/79 of 5500 Gallons of Contaminated Water, NBN); and
- P-Area Cask Car Railroad Tracks as Abandoned (NBN).

##### Potential Source Areas

PSAs have been identified in and around P Area by previous groundwater pre-work plan characterizations associated with the PRGW OU. As a result of data reviews, five areas were identified as PSAs to the groundwater (Figure 3) and were characterized. The five PSAs are as follows:

- PSA 1: Emergency Cooling Water Retention Basin (904-86G);
- PSA 2: Area around the Cooling Water Effluent Sumps (107-P/107-1P);
- PSA 3A: Area near the northern end of the Reactor Building (105-P);
- PSA 3B: Area west of the Administrative/Maintenance slab;



- PSA 4: Area east of the Reactor Building (105-P); and
- PSA 5: Two localized areas in the southwestern part of P Area.

PSA 3 is subdivided into two areas because both contribute to the same VOC groundwater plume but are located in two different areas within P Area (Figure 3). The first area, PSA 3A, is located in an area north of the Reactor Building (105-P), where TCE is the primary contaminant. The second area, PSA 3B, is located near the Administration/Maintenance slab where PCE is the primary contaminant. Other VOCs are also present in these two source areas. Previous groundwater investigations indicate these areas to be potential continuing source areas to the TCE/PCE groundwater plumes.

#### Deactivation and Decommissioning Structures

The category is comprised of the Reactor Building (105-P) and its ancillary structures (Engine Houses [108-1P and 108-2P]). In situ decommissioning is anticipated for the Reactor Building (105-P) based on agreements with the FFA parties and is subject to completion of a CERCLA Record of Decision (ROD) for the selected end-state.

Based on the locations of the FFA OUs, PSAs, and facilities that comprise the PAOU, these eleven subunits were grouped into the following five IUs (Figure 4 and Table 1):

- Southern Vadose Zone Investigative Unit.
- P-Area Ash Basin Investigative Unit;
- Cooling Water System Investigative Unit;
- Northern Vadose Zone Investigative Unit; and
- P-Reactor Investigative Unit;

Table 1 identifies the IUs and associated subunit(s) that comprise the PAOU. The table also denotes the issue(s) (surficial risk, contaminant migration, and/or PTSM) that was addressed through PAOU characterization and data analysis.

## **5.0 Unit Assessment**

A comprehensive approach was implemented to address potential impact to the environment, human health, and ecological receptors at the PAOU. Characterization activities were discussed at the March 2007 Scoping Meeting. The associated Problems Warranting Action and Remedial Action Objectives were agreed upon for the five investigative units.

As a result of the contaminant migration and PTSM analysis and the BRA, the following seven subunits (within the five IUs) were identified as having problems that warrant a response action:

Investigative Unit	Subunit	Constituent(s)	Driver	Size of Area
Ash Basin	Ash Basin	Metals, radionuclides	risk to human health and ecological receptors	10.5 ha (26 ac); varying ash thickness
	P007	Radionuclides, Arsenic	Risk to human receptors	0.36 ha (0.9 ac)
Northern Vadose Zone	Potential Source Area 3B	VOCs (PCE)	groundwater impact	0.27 ha (0.68 ac); 3-13.7m bls (10-45 ft bls)
Reactor	Reactor Building (105-P)	TBD	TBD	TBD
	Potential Source Area 3A	VOCs (TCE)	groundwater impact	0.48 ha (1.17 ac); 2-13.7m bls (6-45 ft bls)
	High Contamination Area	Radionuclides (Cs-137 and Co-60)	risk to human health, PTSM	45 m <sup>3</sup> (59 yds <sup>3</sup> ); 6.1x12.2x0.3m (20x40x1 ft)
Outfalls	P02	Radionuclides	Risk to human receptors	0.065 ha (0.16 ac)

Figure 4 displays the subunits that are the agreed impacted areas as identified during the March 2007 Scoping Meeting. These subunits require agreement on the Likely Response Actions to be carried forward in the Feasibility Study section of the Combined Document for the PAOU.

## 5.1 Southern Vadose Zone Investigative Unit

The Southern Vadose Zone Investigative Unit consists of approximately 40 acres south of the reactor inner-fence line. This IU comprises two localized areas in the southwestern part of P Area (PSA 5). Further review of the sewer system identified a section of process sewer lines (PSLs) that cross into this IU.

### 5.1.1 PSA 5: Two Localized Areas in the Southwestern Part of P Area

This area focuses on two small areas in the southwestern part of P Area where concentration levels of PCE in the groundwater exceeded the MCL (5 µg/l). As an outcome of the field characterization, no VOCs were determined to be present in the area. However, groundwater data at one location exhibited elevated PCE slightly above MCL in one of three analyses

performed on two samples collected. No PCE was detected in groundwater samples collected around this location.

### **Problems Warranting Action**

- There is no soil contamination related to this subunit. However, there are contaminated pipelines present in the subsurface within this investigative unit (See Section 5.5.3).

### **Remedial Action Objectives**

- None.

### **Scope of Problem Warranting Action**

- None.

### **Likely Response Actions**

- No specific action(s) to the soils in this subunit (See Section 5.5.3 for actions related to pipelines).

### **Uncertainty**

- The cause of VOC exceedances in groundwater is unknown. PCE had a detection of 5.4 ug/L (MCL= 5 ug/L) and vinyl chloride had a detection of 24 ug/L (MCL= 2 ug/L). Soil and groundwater data conflict. The uncertainty will be resolved by a weight of evidence discussion in the PAOU to support that PSA 5 is not a continuing source to groundwater and sampling in support of the PRGW OU RI.

## **5.2 P-Area Ash Basin Investigative Unit**

The P-Area Ash Basin Investigative Unit consists of approximately 26 acres in and around the P-Area Ash Basin (188-0P). The ash basin and the P007 outfall are the subunits identified in this IU.

### **5.2.1 Ash Basin**

The subunit contains elevated concentrations of natural occurring metals (arsenic) and radionuclides contained with the ash/partially burned coal deposits within and exterior to the basin as a result of combustion of coal for power in support of facility operations. Cesium-137 was determined to be present in the ash samples; however, the activities are low, within background activities, and are attributed to fallout. Characterization was performed at the interior of the ash basin and surrounding area as depicted in Figure 5.

### **Problems Warranting Action**

- Arsenic, potassium-40, radium-226 (+D), radium-228 (+D), thorium-228 (+D), and uranium-238 (+D) are present in surface ash that exceeds 1E-06 risk levels (total media risk = 2.5E-04) to the industrial worker.

- Arsenic (HQ=1.3 [shrew]) and selenium (HQ=7.9 [shrew] and HQ=5.2 [robin]) exist in surface ash that exceeds an HQ of 1 for ecological receptors.

### **Remedial Action Objectives**

- Prevent industrial worker exposure to contaminated surface ash.
- Prevent ecological exposure to contaminated surface and subsurface ash.

### **Scope of Problem Warranting Action**

- The scope of the problem is the ash interior and exterior to the basin (~26 acres).

### **Likely Response Actions**

- Institutional Controls
- Soil Cover – implemented with institutional controls
- Focused Reclamation (i.e., soil amendments, enhanced vegetation, etc.) - implemented with institutional controls

### **Uncertainty**

- It is uncertain whether or not the ecological HQ exceedances warrant action. This uncertainty impacts the likely response actions. This uncertainty will be managed through core team discussions concerning the reevaluation of the lines of evidence and possible data needs.

#### **5.2.2 P007 Outfall**

The P007 outfall is collocated with ash deposits exterior to the ash basin. Because the possible source of the material is from process line discharges that originate from the disassembly basin area, the P007 outfall was evaluated independent of the Ash Basin. Gamma overflight data indicated a localized area of elevated gamma activity in the P007 outfall. Sampling did determine elevated activities of cesium-137 and cobalt-60 at one sampling location. Figure 6 shows the extent of the P007 outfall as it relates to the ash deposits from the Ash Basin maintenance operations.

### **Problems Warranting Action**

- Radiological (Cs-137 [+D], Co-60) constituents are present in surface ash and exceed  $1 \times 10^{-6}$  risk levels ( $4.5 \text{E-}04$ ) to the industrial worker.

### **Remedial Action Objectives**

- Prevent industrial worker exposure to contaminated surface ash.

### **Scope of Problem Warranting Action**

- The scope of the problem at the P007 outfall is estimated at 0.90.

## Likely Response Actions

- Institutional Controls
- Excavate – implement along with institutional controls

## Uncertainty

- It is uncertain as to the lateral and vertical extent of radiological contamination from the process sewer line discharges within the P007 outfall. This uncertainty impacts the scope of the problem warranting action. This uncertainty will be addressed through confirmation sampling after excavation and documented in the Post-Construction Report.
- It is uncertain if PTSM exists that exceed screening target thresholds. This also impacts the scope of the problem warranting action. This uncertainty will be addressed through confirmation sampling following excavation of the Cs-137 and Co-60 contaminated soil from the process sewer line discharges. Residual ash will be managed consistent with the selected remedy for the ash basin.
- It is uncertain what the appropriate RGO is for determination of the extent of the excavation of the radiological constituents (Cs-137 and Co-60) from the disassembly basin discharges versus contaminants from ash. This uncertainty impacts the scope of the problem warranting action and remedial costs. This uncertainty will be resolved through further core team discussions.

## 5.3 Cooling Water System Investigative Unit

The Cooling Water System Investigative Unit consists of approximately 12.5 acres around the Cooling Water Reservoir (186-P) and Cooling Water Pump House (190-P). Two subunits were grouped under the Cooling Water System Investigative Unit:

- Potential Release from the P-Area Reactor Cooling System (186/190-P); and
- P-Area Process Sewer Lines as Abandoned (see Section 5.5.3)

### 5.3.1 Potential Release from P-Area Reactor Cooling System

The primary concern associated with this subunit is the impact to surface soils, subsurface soils and groundwater from intermittent overflow from the cooling water basins.

## Problems Warranting Action

- There is no soil contamination related to these subunits. However, there are contaminated pipelines present in the subsurface within this investigative unit (See Section 5.5.3).

## Remedial Action Objectives

- None.

### **Scope of Problem Warranting Action**

- None.

### **Likely Response Actions**

- No specific action(s) to the soils in this subunit (See Section 5.5.3 for actions related to pipelines).

### **Uncertainty**

- None.

## **5.4 Northern Vadose Zone Investigative Unit**

The Northern Vadose Zone Investigative Unit consists of approximately 14 acres north of the reactor inner-fence line. Three subunits were characterized within the Northern Vadose Zone Investigative Unit:

- P-Area Process Sewer Lines as Abandoned (see Section 5.5.3);
- PSA 2: Area around the Cooling Water Effluent Sumps (107-P/107-1P); and
- PSA 3B: Area west of the Administrative/Maintenance slab.

### **5.4.1 Potential Source Area 2**

The concern with this PSA was associated with elevated gross alpha and nonvolatile beta activities in the groundwater near the cooling water effluent sumps that are located in this PSA. PAOU sampling was performed in this PSA to determine impact to subsurface soils and groundwater that might have occurred from potential release(s) from the sumps or PSLs that are located in this PSA.

### **Problems Warranting Action**

- There is no soil contamination related to this subunit. However, there are contaminated pipelines present in the subsurface within this investigative unit (See Section 5.5.3).

### **Remedial Action Objectives**

- None.

### **Scope of Problem Warranting Action**

- None.

### **Likely Response Actions**

- No specific action(s) to the soils in this subunit (See Section 5.5.3 for actions related to pipelines).

## Uncertainty

- None.

### 5.4.2 Potential Source Area 3B

Previous investigations determined the presence of a VOC source area (primarily PCE) in an area west of the administration/maintenance slab as a result of previous operations and maintenance activities in this area. Previous investigation of the area confirmed the presence of VOC soil contamination in the area. The concern with this PSA is the presence of VOCs in subsurface soils that are impacting local groundwater.

#### Problems Warranting Action

- The vadose zone has residual levels of VOCs (principal contaminant PCE 1.35 mg/kg) that are migrating to the groundwater at levels that exceed the MCL.

#### Remedial Action Objectives

- Reduce migration of VOCs from the vadose zone soils to levels that will not exceed the MCL in groundwater.

#### Scope of Problem Warranting Action

- The scope of the problem includes an area of approximately 0.27 ha (0.68 ac) of VOCs contaminated subsurface soil from 3 m (10 ft) down to the top of the UAZ exterior to the Administrative/Maintenance slab.

#### Likely Response Actions

- Institutional Controls
- SVE (presumptive remedy) – implement with groundwater monitoring and institutional controls
- Groundwater Monitoring – stand alone technology

#### Uncertainty

- In the unlikely event that inhabited buildings are constructed over subsurface VOC contamination, it is uncertain if the VOCs would be of sufficient volatility and toxicity to migrate into building air space at levels that would pose an unacceptable risk to future occupants. This uncertainty impacts when and if vapor intrusion (VI) modeling should be performed. Currently, the VI intrusion pathway at PAOU is incomplete because no inhabited buildings are present and it is unlikely that future building construction will take place. To address the uncertainty that VI modeling is not necessary at PAOU, a brief discussion will be added to the BRA referencing the SRS site-wide air intrusion evaluation performed under GPRA that concluded that the VI was not a complete exposure pathway at SRS. In addition, a land use control objective will be added to the

ROD and LUCIP to prevent construction of inhabitable buildings without a VI evaluation.

## **5.5 P-Reactor Investigative Unit**

The following subunits are grouped under the P-Reactor Investigative Unit (Figure 2 and Figure 3):

- Potential Release from the P-Area Disassembly Basin;
- P-Area Reactor Area Cask Car Railroad Tracks as Abandoned;
- P-Area Process Sewer Lines as Abandoned including the Spill on 3/15/79 of 5500 Gallons of Contaminated Water;
- P-Reactor Building (105-P) and ancillary structures; and
- PSAs 1, 3A, and 4.

The primary facility within the P-Reactor Investigative Unit is the Reactor Building (105-P). The expected end state for the Reactor Building (105-P) is *in situ* decommissioning. The level of effort required for facility deactivation will be addressed through future Core Team discussions and stakeholder involvement.

### **5.5.1 Potential Release from P-Area Disassembly Basin**

The investigation of this subunit pertained to spills/releases that may have occurred exterior to the basin via process sewer lines, tank transfers, discharges to the seepage basins, and overflow of weirs. Incidental leaks from piping and equipment exterior to the basin may have released tritium, other radiological constituents, and metals to subsurface soil. However, previous soil sampling investigations conducted around the exterior of the reactor building that houses the basin did not indicate the presence of man-made radiological constituents in the soil.

#### **Problems Warranting Action**

- There is no soil contamination related to this subunit. However, there are contaminated pipelines present in the subsurface within this investigative unit (See Section 5.5.3).

#### **Remedial Action Objectives**

- None.

#### **Scope of Problem Warranting Action**

- None.

#### **Likely Response Actions**

- No specific action(s) to the soils in this subunit (See Section 5.5.3 for actions related to pipelines).



## Uncertainty

- None.

### **5.5.2 P-Area Reactor Area Cask Car Railroad Tracks as Abandoned**

The investigation of this OU pertained to incidental leaks from the cask cars that may have affected surface soil with tritium and other radiological constituents. The principal impact to the environment is associated with an identified High Contamination Area (HCA) along the railroad tracks (Figure 7) where contaminated water leaked from cask cars onto the railroad tracks, cross ties, and railroad bed (gravel).

#### **Problems Warranting Action**

- Cesium-137 (+D) (risk=5.6E-03) and cobalt-60 (risk=9.9-06) are present in surface gravel/cross ties that exceeds 1E-06 risk levels (total media risk=5.6E-03) to the industrial worker at the HCA.
- Cesium-137 (+D) (risk=1.8E-02) is present in the gravel/cross tie at concentrations that exceeds PTSM levels.

#### **Remedial Action Objectives**

- Prevent industrial worker exposure to contaminated surface gravel/cross ties.
- Remove or treat PTSM to the extent practical within the gravel/cross ties.

#### **Scope of Problem Warranting Action**

- A radiological contaminated area of 45 m<sup>3</sup> (59 yds<sup>3</sup>), defined as a HCA on a section of railroad tracks near the Reactor Building (105-P), exceeds industrial human health risk of 1E-06 and PTSM trigger screening levels of 1E-03.

#### **Likely Response Actions**

- Excavation – implemented with institutional controls.

## Uncertainty

- None.

### **5.5.3 P-Area Process Sewer Lines as Abandoned**

Subsurface soils were sampled around and below the PSLs (Figure 8) and no contamination were determined as a result of a release from the PSLs and the Spill on 03/15/79 of 5500 Gallons of Contaminated Water, NBN. However, there is a potential for a release from the lines and there is fixed contamination (i.e., cesium-137 and cobalt-60) present within the PSLs. Due to the difficulty in accessing the lines, there is a potential for PTSM to be present within the lines.

### **Problems Warranting Action**

- The PSLs are a conduit for surface water discharge, representing an unacceptable condition.
- Based on process knowledge and data from other Reactor Areas (R- and C-Area), it is assumed that fixed radiological contamination is present within the PSLs which could be released to the environment and/or accessed in the future.

### **Remedial Action Objectives**

- Eliminate water flow through the PSLs.
- Prevent possible exposure to contaminated PSLs.
- Prevent a release from the PSLs to groundwater in exceedance of MCLs or PRGs.

### **Scope of Problem Warranting Action**

- PSLs and connected piping are present throughout P-Area and represent 2.9 miles of lines.

### **Likely Response Actions**

- Institutional controls
- Impermeable intruder barrier – implemented with institutional controls.
- Isolation and plugging of the Reactor Building (105-P) PSL and drainage system from the existing PSL – implemented with institutional controls.
- Grouting of manholes, diversion boxes, and process tanks (106-P and 109-P) – implemented with institutional controls and isolation and plugging of the 105-P PSL.
- Select removal of process equipment external to the reactor building, as appropriate – implemented with institutional controls and isolation and plugging of the 105-P PSL.
- Groundwater monitoring– implemented with institutional controls.
- Sealing/plugging access locations at outfalls – implemented with institutional controls, grouting of manholes, diversion boxes and process tanks, in addition to isolation and plugging of the 105-P PSL.
- Cover– implemented with institutional controls and isolation and plugging of the 105-P PSLs.

### **Uncertainty**

- It is uncertain if the fixed contamination would result in a release to the environment if the PSLs were to fail. This uncertainty will be managed through likely response actions to mitigate a potential release to the environment.

#### **5.5.4 Reactor Building (105-P)**

As agreed upon with Area Completion Team, work associated with the Reactor Building (105-P) will be conducted in a phased approach. Scoping of the Reactor Building (105-P) is currently underway.

##### **Problems Warranting Action**

- To be determined - Unclear definition of *in situ* end state, and whether further characterization/investigation will be necessary.

##### **Remedial Action Objectives**

- To be determined.

##### **Scope of Problem Warranting Action**

- To be determined.

##### **Likely Response Actions**

- *In situ* Decommissioning

##### **Uncertainty**

- USDOE acknowledges that the approach to evaluating and integrating the reactor into the area operable unit decision making process is not yet finalized. This will be managed in parallel and should not interfere with the scoping of soil sites and building remnants.

#### **5.5.5 PSA 1: Emergency Cooling Water Retention Basin (904-86G)**

The soil located around the 1,892,500 liter (500,000-gallon) contaminated-water storage tank within the retention basin was sampled to determine if there was impact to surface soils associated with previous water transfer activities from the tank to the nearby seepage basins. There is a potential for leaks to have occurred from the tank to the basins that would impact surface soils.

##### **Problems Warranting Action**

- None.

##### **Remedial Action Objectives**

- None.

##### **Scope of Problem Warranting Action**

- None.

### **Likely Response Actions**

- None.

### **Uncertainty**

- None.

### **5.5.6 PSA 3A: Area near the Northern End of the Reactor Building**

Previous investigations determined the presence of a VOC source area (primarily TCE) in an area north of the Reactor Building (105-P) as a result of previous operations and maintenance activities in this area. The investigation of the area confirmed the presence of VOC soil contamination in the area. The concern with this PSA is the presence of VOCs in subsurface soils that are impacting local groundwater.

### **Problems Warranting Action**

- VOC contamination are present in the vadose zone at concentrations up to 12.5 mg/kg (TCE) and are continuing as a source to groundwater contamination exceeding the MCLs.

### **Remedial Action Objectives**

- Reduce leaching of VOCs from the vadose zone to groundwater at levels that exceed MCLs.

### **Scope of Problem Warranting Action**

- VOC contamination are present in the vadose zone from 2 m (6 ft) down to the top of the UTRA in an area approximately 0.48 ha (1.17 ac) north of the Reactor Building (105-P).

### **Likely Response Actions**

- Institutional Controls
- SVE (presumptive remedy) – implemented in combination with groundwater monitoring and institutional controls
- Chemical Oxidation – implemented in combination with SVE, groundwater monitoring, and institutional controls
- Groundwater Monitoring – stand alone technology

### **Uncertainty**

- In the unlikely event that inhabited buildings are constructed over subsurface VOC contamination, it is uncertain if the VOCs would be of sufficient volatility and toxicity to migrate into building air space at levels that would pose an unacceptable risk to future occupants. This uncertainty impacts when and if vapor intrusion (VI) modeling should be performed. Currently, the VI intrusion pathway at PAOU is incomplete because no

inhabited buildings are present and it is unlikely that future building construction will take place. To address the uncertainty that VI modeling is not necessary at PAOU, a brief discussion will be added to the BRA referencing the SRS site-wide air intrusion evaluation performed under GPRA that concluded that the VI was not a complete exposure pathway at SRS. In addition, a land use control objective will be added to the ROD and LUCIP to prevent construction of inhabitable buildings without a VI evaluation.

#### **5.5.7 PSA 4: Area east of the Reactor Building**

Previous groundwater investigations indicated the presence of VOCs in the groundwater east of the Reactor Building (105-P). However, no data were available to determine if a source was present that was or has contributed to the groundwater contamination. As a result of the investigation, no VOC source area was determined or the presence of VOC contamination. A localized area with elevated VOCs at shallow depths was determined near an old abandoned diesel tank, however, no soil contamination was determined at depth or in the groundwater. The presence of the VOCs in the groundwater can be attributed to the fluctuation of the shallow water table, existing VOC source areas, and radial groundwater flow from the reactor area.

#### **Problems Warranting Action**

- None.

#### **Remedial Action Objectives**

- None.

#### **Scope of Problem Warranting Action**

- None

#### **Likely Response Actions**

- None.

#### **Uncertainty**

- None.

### **5.6 Other –P02 Outfall**

Based on gamma overflight data, two areas outside of P Area indicated elevated radioactivity in surface soils. These two areas coincide with the P007 outfall to the south and the P02 outfall to the northeast of P Area (Figure 9).

The P007 outfall area was separated out from the Ash Basin and is evaluated independently of the Ash Basin's human health and ecological risk assessment and PTSM and contaminant migration evaluations (See Section 5.2).

### **5.6.1 P02 Outfall**

#### **Problems Warranting Action**

- Gamma overflight data indicate a localized area of elevated gamma activity in the upper reaches of the P02 outfall. Investigation of the area did not adequately determine the presence of radionuclides. However, previous sampling events indicate the presence of cesium-137 in the soil. In addition, field survey equipment (i.e., NaI) indicates elevated radionuclide activities above background within the area.

#### **Remedial Action Objectives**

- Prevent industrial worker exposure to contaminated surface soil.

#### **Scope of Problem Warranting Action**

- The area of the P02 outfall is estimated at 0.16 acre.

#### **Likely Response Actions**

- Institutional Controls
- Excavate – implement with institutional controls

#### **Uncertainty**

- It is uncertain as to the lateral and vertical extent of contamination within the P02 outfall. This uncertainty impacts the scope of the problem warranting action. This uncertainty will be addressed through confirmation sampling after excavation and documented in the Post-Construction Report.

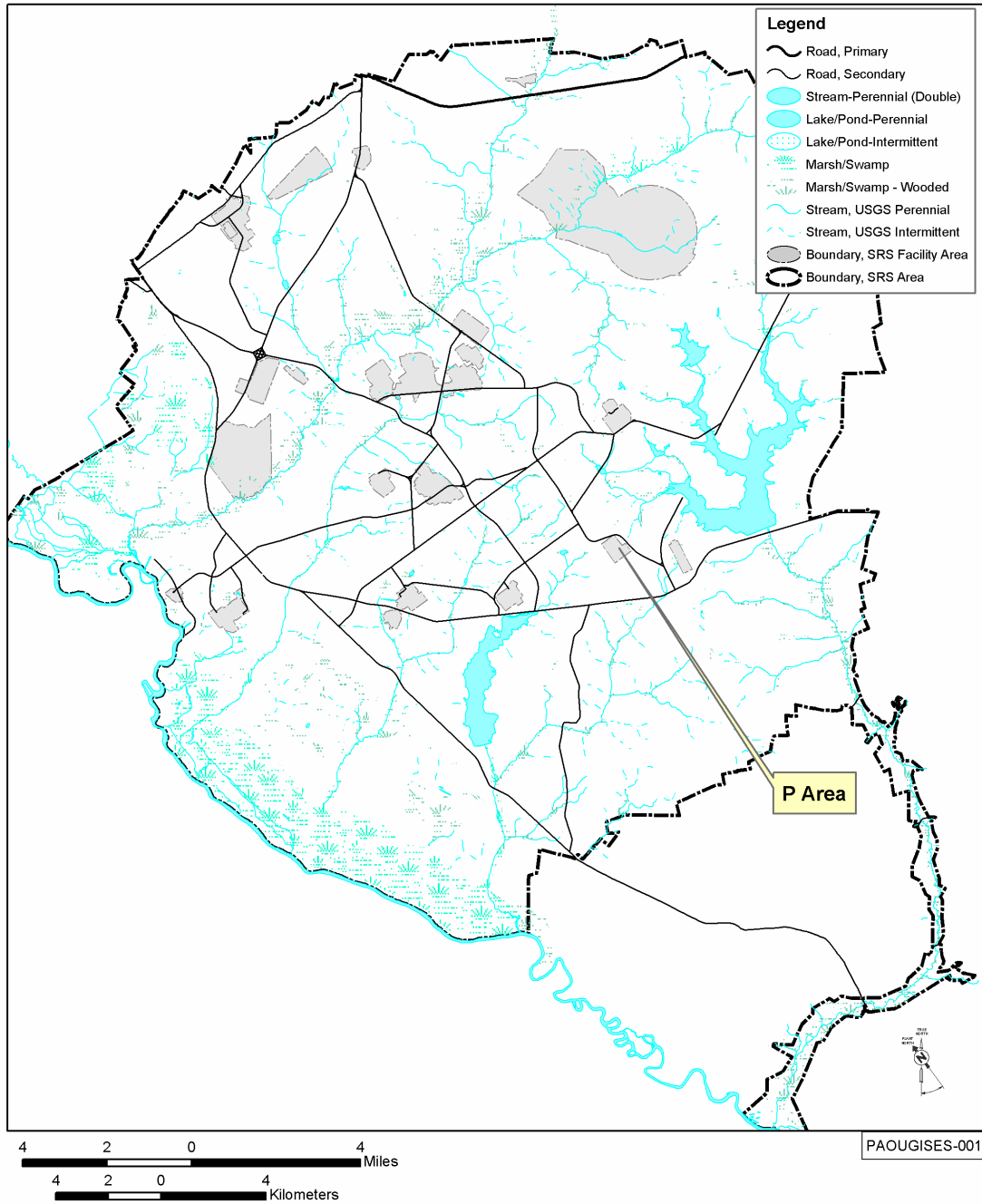
## **6.0 Operable Unit Strategy**

The PAOU RFI/BRA/FS combined document will be submitted on or before September 28, 2007. The Project Team proposes submitting a GIS project with the Rev. 0 RFI/BRA/FS combined document.

A groundwater monitoring strategy will be discussed in the Remedial Action Implementation Plan (RAIP).

Earlier agreements with Area Completion Team members have concurred that the hardened Reactor Building (105-P) would be included within the RI/FS process for area completion. As scoped for the RI Work Plan, characterization and closure of the Reactor Building (105-P) will involve a phased approach. Field characterization and closure alternatives for the Reactor Building (105-P) will be scoped and incorporated into the RI/FS process in later scoping meetings.

Further discussion with the Core team is needed on the integration of the PAOU, proposed early actions, and the pending end state decision for the Reactor Building.



**Disclaimer:**

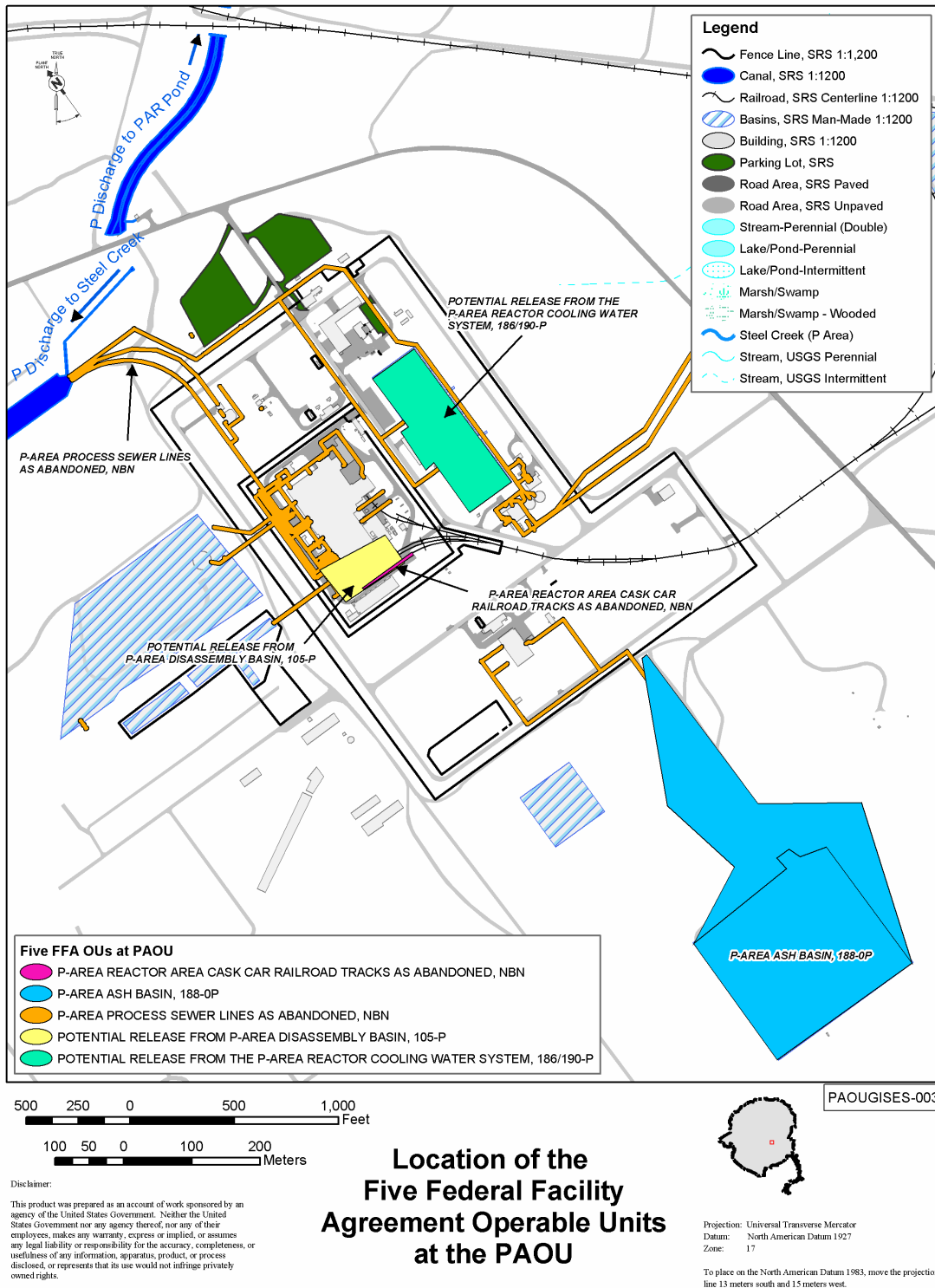
This product was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.

**Location of P Area at the Savannah River Site**

Projection: Universal Transverse Mercator  
 Datum: North American Datum 1927  
 Zone: 17

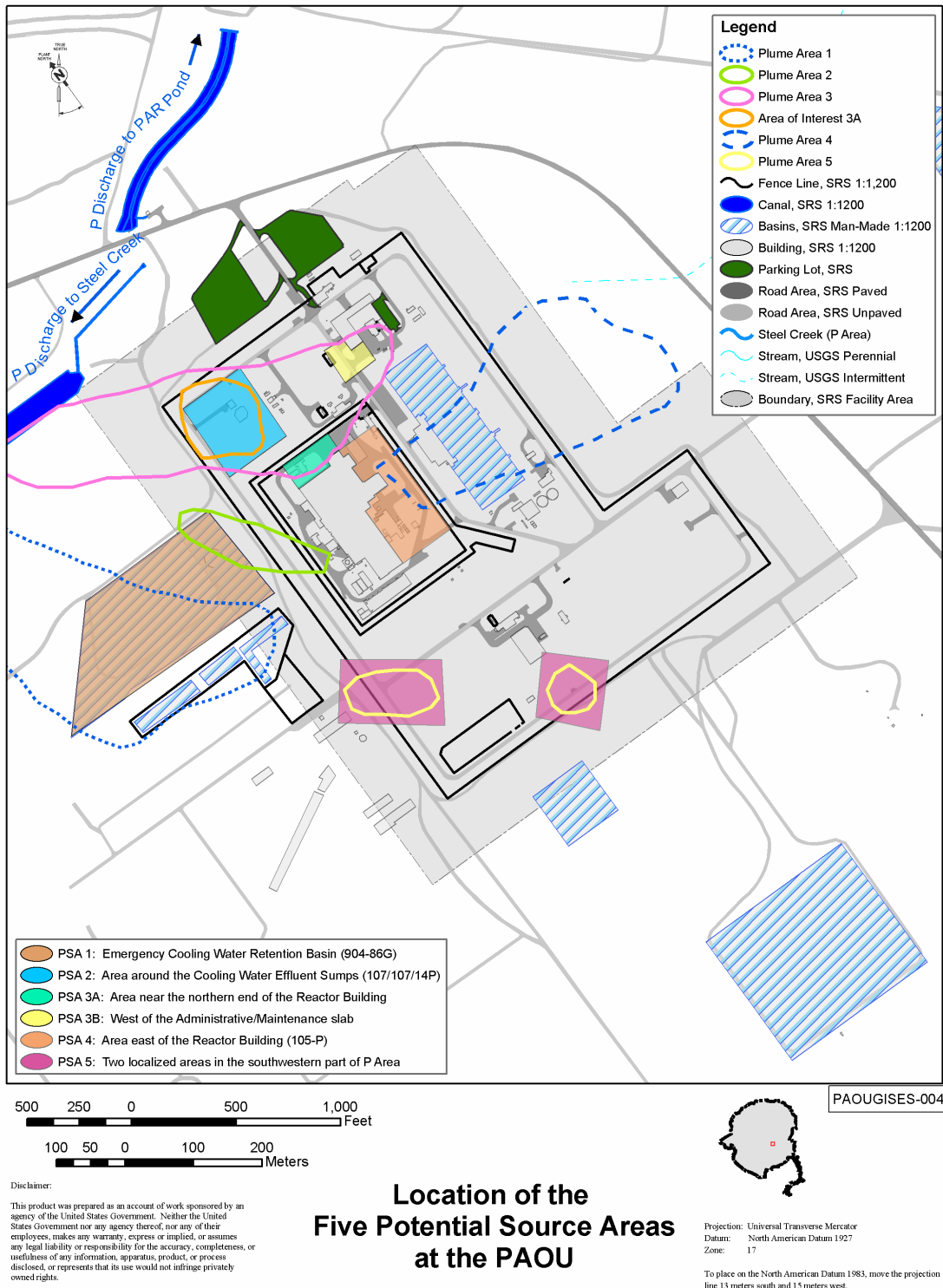
To place on the North American Datum 1983, move the projection line 13 meters south and 15 meters west.

**Figure 1: Location of P Area**



**Figure 2: Location of FFA OUs and Reactor Building**





**Figure 3: Location of PSAs**

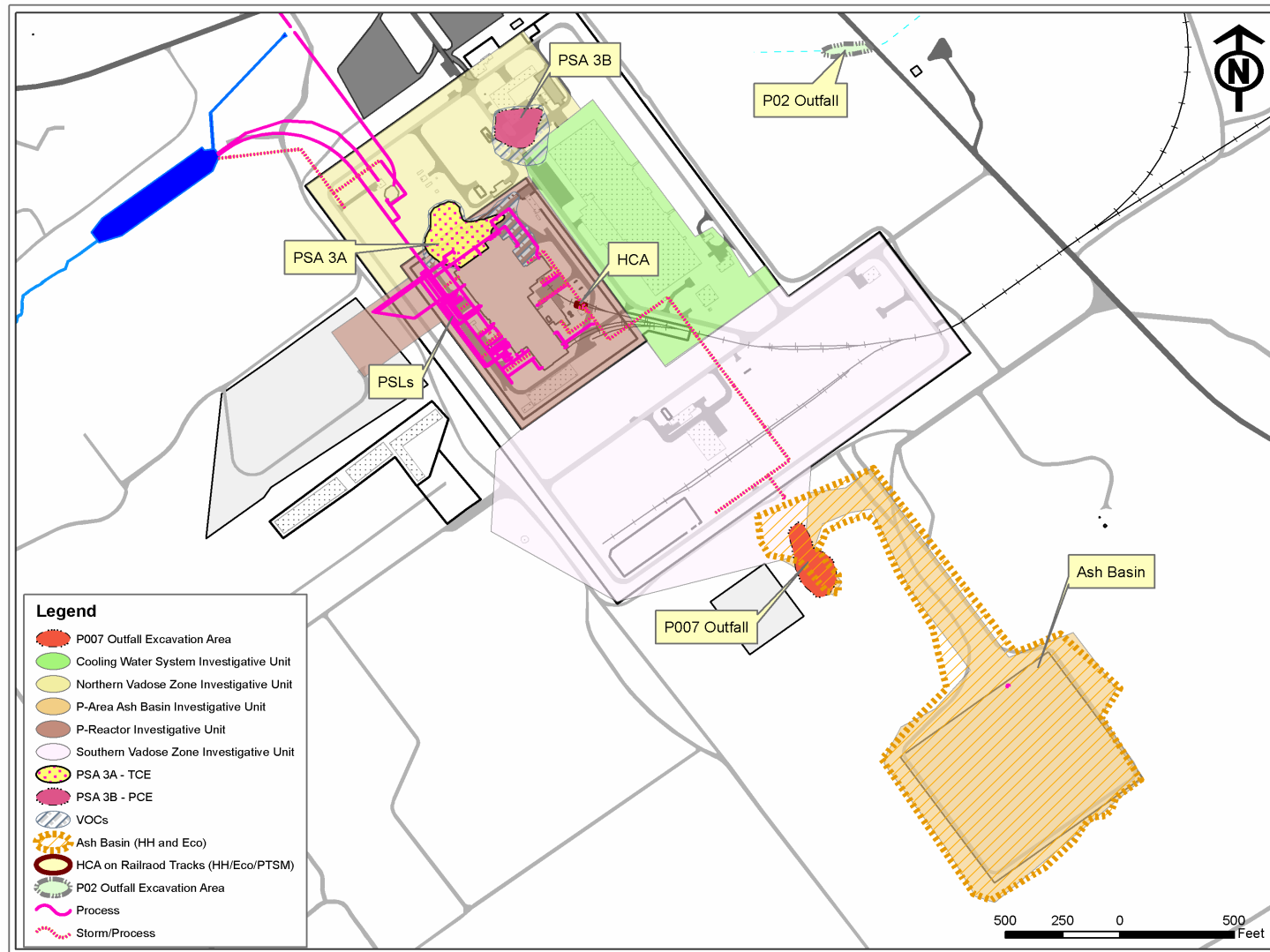
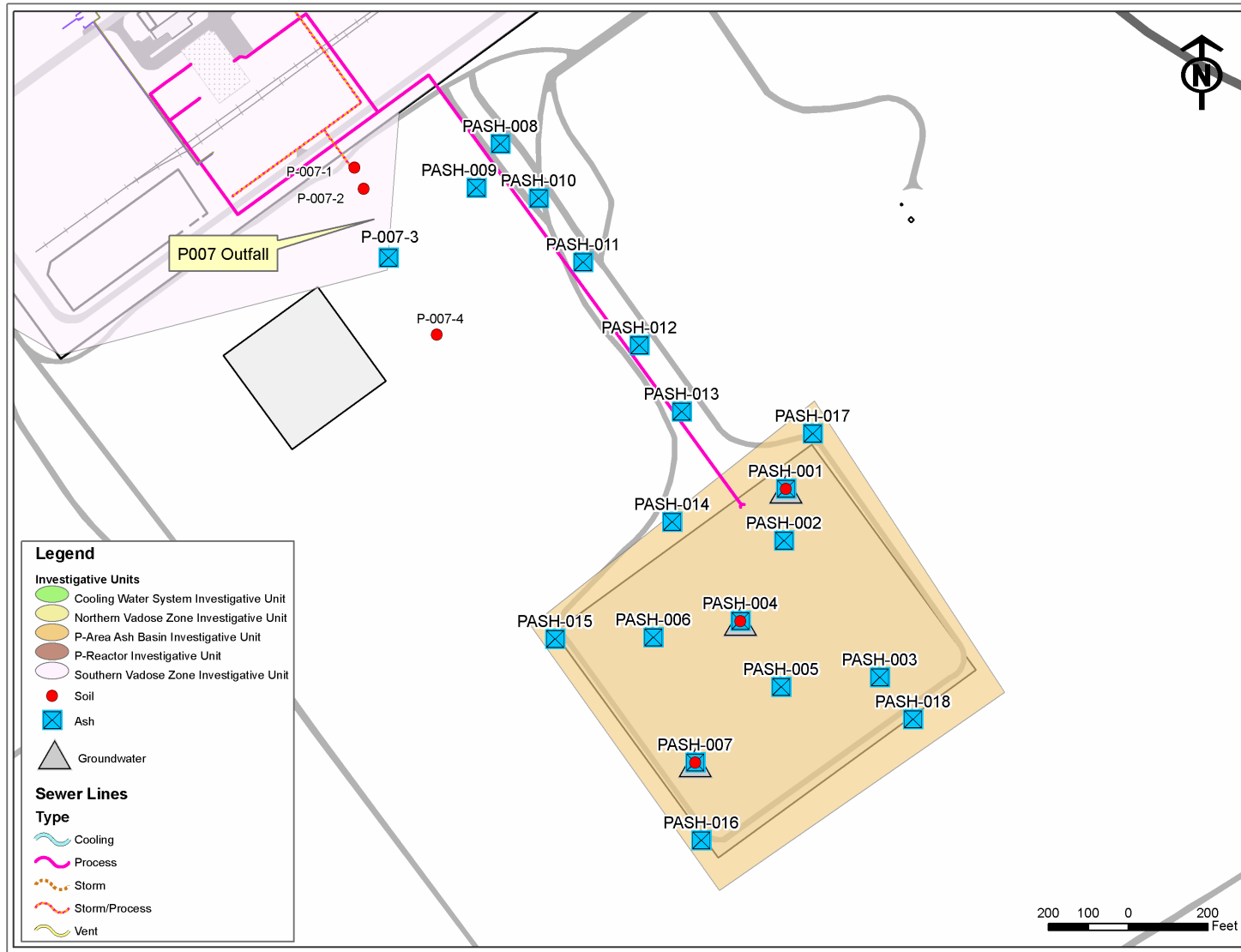
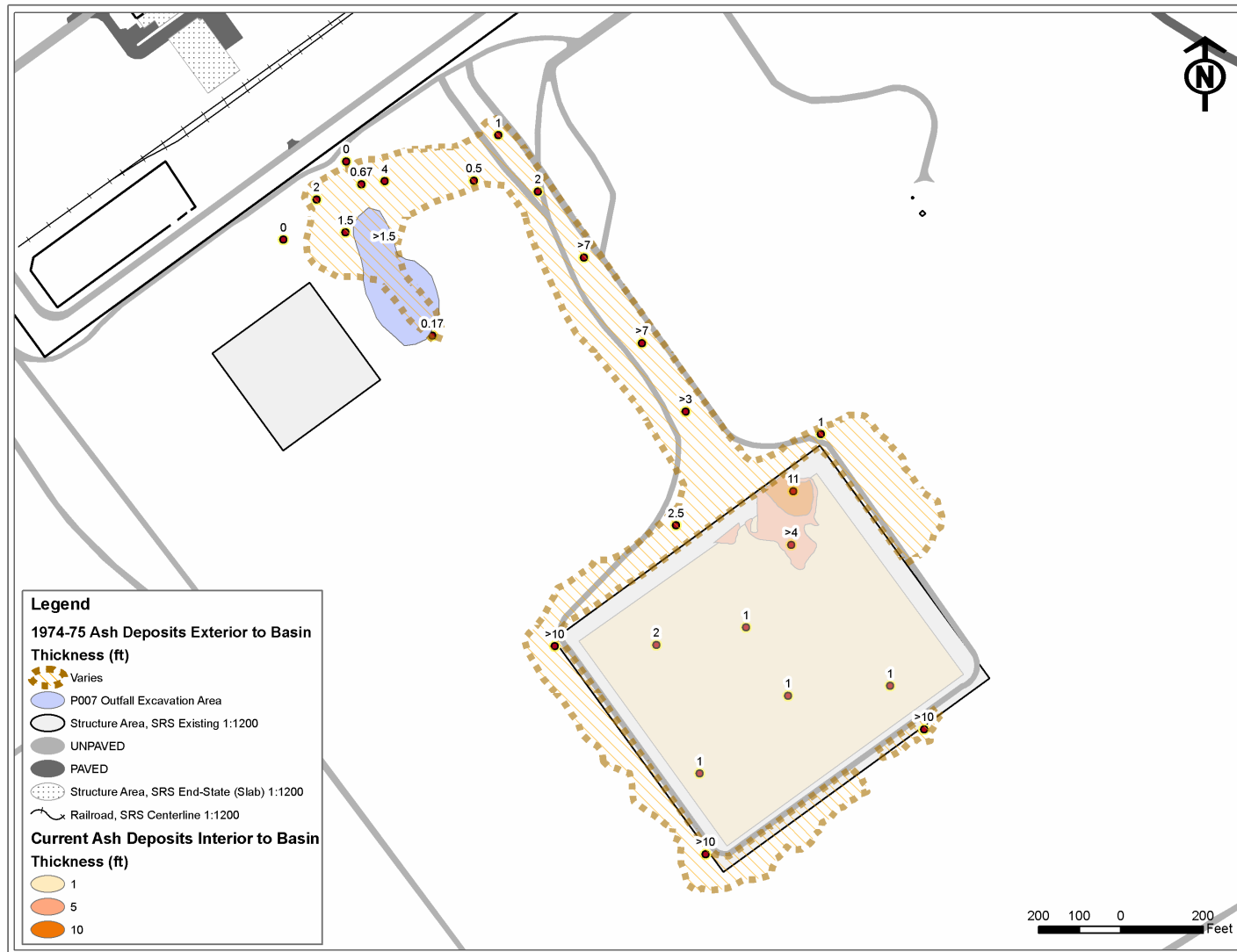


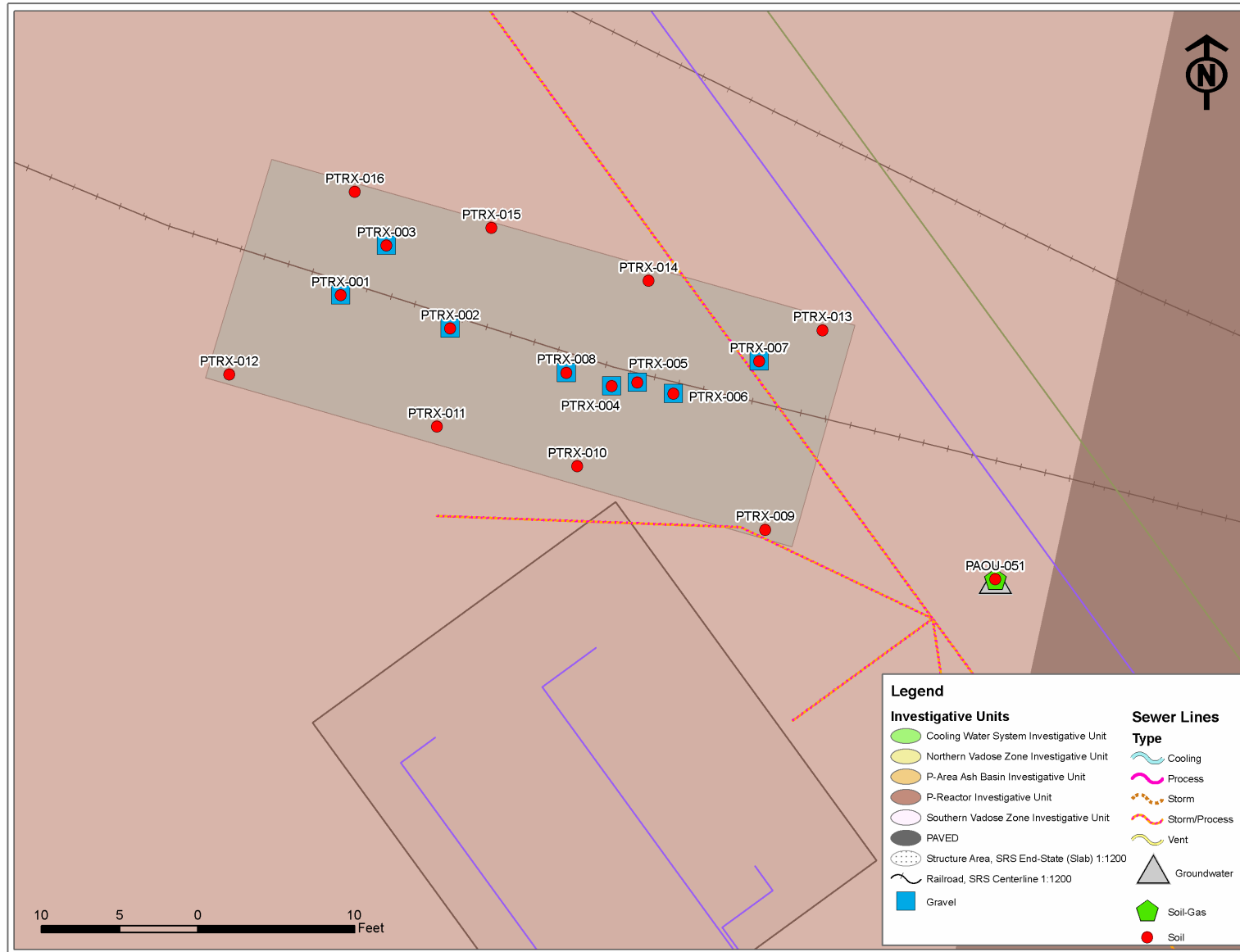
Figure 4: Impacted Areas at the PAOU Investigative Units



**Figure 5: Sampling Locations in the Ash Basin Investigative Unit**



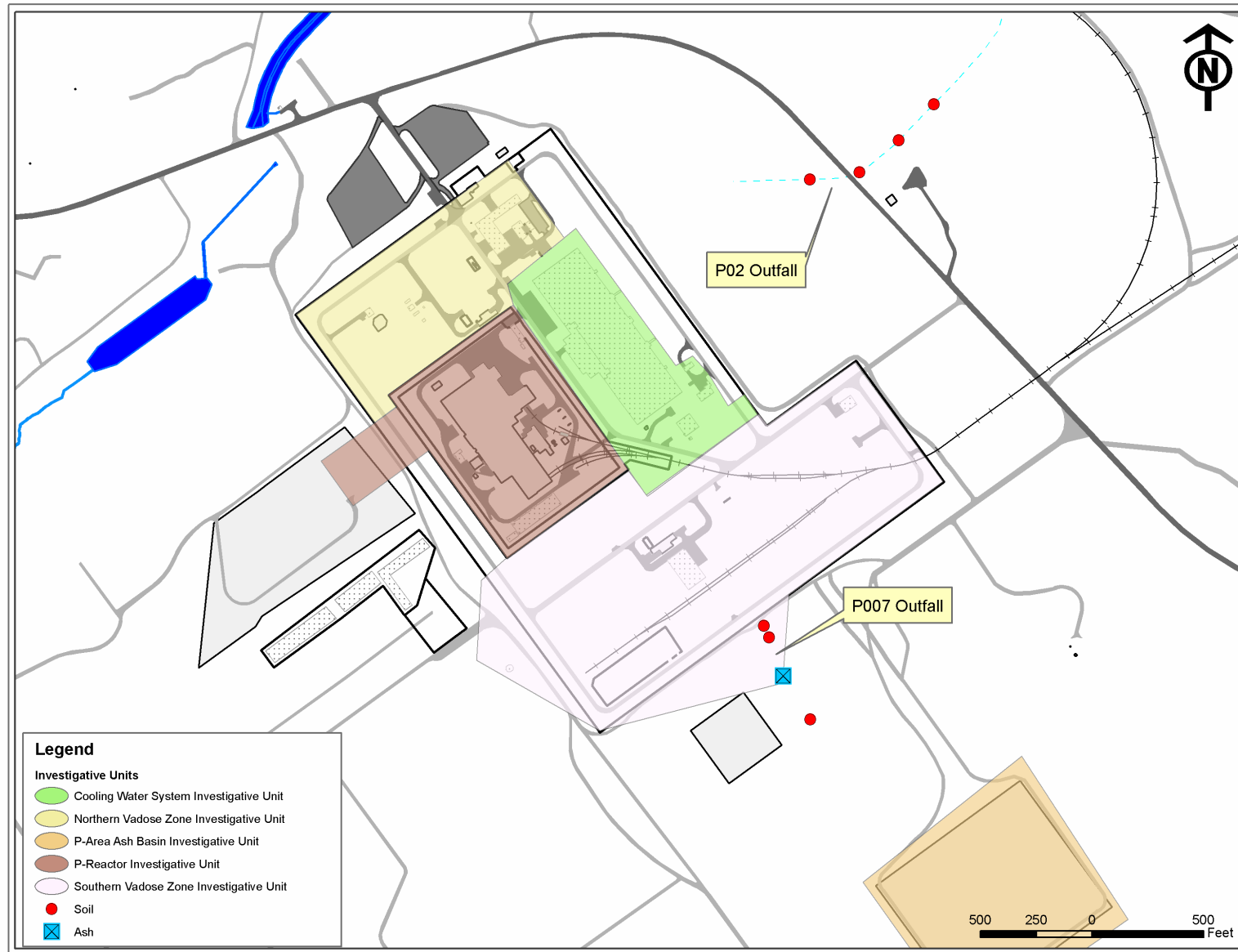
**Figure 6: Ash Deposits at the Ash Basin and P007 Outfall Area**



**Figure 7: Sampling Locations in Railroad Tracks High Contamination Area the P-Reactor Investigative Unit**



**Figure 8: Process Sewer Lines**



**Figure 9: Sampling Locations at the P007 and P02 Outfalls**

**Table 1: Issues Addressed Through Characterization and Data Analysis**

Investigative Unit	Subunit	Issues Addressed by Data Analysis			
		Human Health	Ecological	PTSM <sup>(1)</sup>	Contaminant Migration <sup>(2)</sup>
Southern Vadose Zone	Potential Source Area (PSA) 5				X
	Process Sewer Lines (PSL) as Abandoned			X	X
Ash Basin	Ash Basin	X	X	X	X
Cooling Water System	Potential Release from P-Reactor Cooling Water System (186/190-P)	X	X		X
	PSL			X	X
Northern Vadose Zone	PSA 2			X	X
	PSA 3B				X
	PSL			X	X
P-Reactor	PSA 1	X	X		
	PSA 3A				X
	PSA 4				X
	Potential Release from the P-Area Disassembly Basin (105-P)			X	X
	PSL			X	X
	P-Area Cask Car Railroad Tracks	X		X	X

X - denotes data analysis performed for the identified issue as described in the Rev 1.1 P-Area Operable Unit Work Plan (WSRC-RP-2005-4081).

(1) PTSM based on toxicity using risk  $\geq 1E-03$  (carcinogens) or hazard index  $\geq 10$  (noncarcinogens) for the future industrial worker

(2) Contaminant migration was performed on the mobility of the constituents as it related to groundwater impact