



**STATEMENT OF BASIS**  
**CENTRAL HEAT PLANT SWMU 45**  
**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**  
**KENNEDY SPACE CENTER**  
**BREVARD COUNTY, FLORIDA**



**PURPOSE OF STATEMENT OF BASIS**

This Statement of Basis (SB) has been developed to inform and give the public an opportunity to comment on a proposed remedy to address contamination at the Central Heat Plant (CHP)<sup>1</sup>. A Kennedy Space Center (KSC) Remediation Team consisting of National Aeronautics and Space Administration (NASA), United States Environmental Protection Agency (EPA), and Florida Department of Environmental Protection (FDEP) has determined that the proposed remedy is cost effective and protective of human health and the environment. However, prior to implementation of the proposed remedy, the KSC Remediation Team would like to give an opportunity for the public to comment on the proposed remedy. At any time during the public comment period, the public may comment as explained in the “How Do You Participate” section of this SB. After the end of the public comment period, the KSC Remediation Team will review all comments and issues raised in the comments and determine if there is a need to modify the proposed remedy prior to implementation.

**WHY IS A REMEDY NEEDED?**

The results of the Resource Conservation and Recovery Act (RCRA) Facility Investigation

(RFI) indicated that several volatile organic compounds (VOCs) listed in Table 1 are present in groundwater, which could be potentially harmful to human health if this water was used for human consumption now or in the future.

**HOW DO YOU PARTICIPATE?**

The KSC Remediation Team solicits public review and comment on this SB before implementing the proposed remedy. The remedy for the CHP will eventually be incorporated into the Hazardous and Solid Waste Amendments (HSWA) Permit for Kennedy Space Center (KSC).

<b>The Cleanup Remedy</b>
<p>The proposed cleanup remedy for the CHP includes the following components:</p> <ul style="list-style-type: none"> <li>▪ Air Sparge and Soil Vapor Extraction</li> <li>▪ Natural attenuation of groundwater to remove contaminants through natural processes.</li> <li>▪ Monitoring of groundwater to document water quality</li> <li>▪ Swale Soil Control</li> <li>▪ Institutional controls to prohibit the use of groundwater as a potable water supply.</li> </ul>

*1. In accordance with RCRA §7004(b), this Statement of Basis summarizes the proposed remedy for the NASA CHP. For detailed information on the site, consult the CHP CMS Report, which is available for review at the information repository located at the North Brevard Library, 2121 South Hopkins Avenue, Titusville, FL 32780, telephone: (321) 264-5026.*

The public comment period for this SB and proposed remedy will begin on the date of publication for notice of availability of the SB in major local newspapers of general circulation and end 45 days thereafter. If requested during the comment period, the KSC Remediation Team will hold a public meeting to respond to any oral comments or questions regarding the proposed remedy. To request a hearing or provide comments, contact the following person in writing within the 45-day comment period:

Mr. John Armstrong, P.G.  
FDEP - Bureau of Waste Cleanup  
2600 Blair Stone Road, MS 4535  
Tallahassee, FL 32399-2400

The HSWA Permit, SB, and associated administrative file, including the RFI Report, will be available to the public for viewing and copying at:

NASA Document Library  
North Brevard Library  
2121 South Hopkins Avenue  
Titusville, FL 32780  
Telephone: (321) 264-5026

To request further information, you may contact one of the following people:

Mr. Harold Williams  
Remediation Program Manager  
Environmental Program Office  
Mail Code: TA-C3  
Kennedy Space Center, FL 32899  
E-mail: [Harold.G.Williams@nasa.gov](mailto:Harold.G.Williams@nasa.gov)  
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Telephone: (850) 245-8981

## **FACILITY DESCRIPTION**

NASA established the KSC as the primary launch site for the space program. These operations have involved the use of toxic and hazardous materials. Under the RCRA and applicable HSWA permit (Permit No. FL6800014585) issued by the FDEP and/or EPA, KSC was required to perform an investigation to determine the nature and extent of contamination from Solid Waste Management Unit (SWMU) No. 45, Central Heat Plant.

## **SITE DESCRIPTION AND HISTORY**

The CHP is a NASA-operated facility that was constructed in 1964. The facility includes the heat plant building, a bulk fuel oil aboveground storage tank, a storage building, a storage shed, a cooling tower, and a support building. Past and current operations at the CHP are to heat water for the high temperature hot water distribution system serving the KSC Industrial Area. A copier contractor is currently using the support building. The site location and facility map are included as Figures 1 and 2, respectively. Investigations conducted at the site include:

- 1991-1992: A petroleum discharge notification form was filed with the FDEP based on a site inspection performed by Brevard County NRMD. The 10,000-gallon aboveground storage tank and associated petroleum contaminated soils were removed from the site.
- 1994-1998: RFI activities were conducted to evaluate impacts to site media. Soil, swale soil, surface water, and groundwater samples were collected and various VOCs were identified in site media above regulatory criteria. Based on these results, a corrective measures study (CMS) report was prepared to address the VOCs in the groundwater.
- 1998-2000: Potential remediation alternatives were evaluated and a CMS report was completed. Based on CMS report conclusions and decisions made during

NASA team meetings, a combination of air sparge and soil vapor extraction (AS/SVE), land use controls (LUCs), and natural attenuation with long-term monitoring was selected as a final remedy.

- 2002-2004: An air sparge soil vapor extraction system was installed and operated as a pilot study.

**SUMMARY OF SITE RISK**

As part of the RFI activities, risk assessments were completed in accordance with KSC's Remediation Team Risk Assessment Decision Process Document (DPD). The ecological risk assessment (ERA) was performed in accordance with the eight-step process described in the EPA's "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments", dated 1997.

Chemicals of Concern (COCs) identified for human health during the RFI included VOCs in groundwater. For a complete list of COCs in groundwater see Table 1.

Based on the preliminary risk assessment (PRE) presented in the RFI, cancer and non-cancer risks would be unacceptable for future use of groundwater as drinking water. The estimated excess lifetime cancer risk for the hypothetical future resident was determined to be 1 in 10, which exceeds EPA's acceptable range of 1 in a million to 1 in 10,000 and exceeds FDEP's acceptable risk goal of 1 in a million. The main contaminant contributing to this cancer risk was vinyl chloride. The non-cancer hazard index (HI) for the future hypothetical resident was estimated to be 80.7, which is above the EPA and FDEP acceptable threshold of 1.0.

COCs in soil were not identified as part of the RFI. However, nickel was detected above the residential soil cleanup target levels (SCTLs) as part of the CMS in the swale soils. Unacceptable risks to potential residential receptors were identified southeast of the CHP building;

therefore, implementation of institutional controls to prohibit residential exposure to site swale soils in this area is required. Since the ditches are often dry, LUCs were recommended in the CMS unless swale soils are excavated as part of routine ditch maintenance.

**WHAT ARE THE REMEDY OBJECTIVES AND LEVELS?**

The remedial action objective (RAO) is to prohibit residential use of swale soils and protect humans from exposure to groundwater by preventing its use as a drinking water source and by implementing groundwater cleanup.

The COCs present in groundwater and swale soil at the CHP are listed in Table 1. The first column is the chemical name, the second column is the range of concentrations in groundwater and swale soil detected at the CHP during the RFI, and the last column is the FDEP cleanup target level to be achieved at the site.

Table 1

Site-Related Chemicals of Concern (COCs)	Range of Detections <sup>1</sup>	Site-Specific Cleanup Level <sup>2</sup> (µg/L)
<b>Groundwater (µg/L)</b>		
Cis-1,2-dichloroethene	0.79-2,700	70
1,1-dichloroethane	0.68-1,200	70
Tetrachloroethene	3.6-5,300	3
Trichloroethene	0.87-13,000	3
Vinyl Chloride	0.97-2,100	1
<b>Soil (mg/kg)</b>		
Nickel	37.1-226	110

<sup>1</sup> Detections in monitoring wells.

<sup>2</sup> Groundwater cleanup levels are GCTLs and soil cleanup levels are SCTLs for residential exposure (Florida Administrative Code 62-777.)

## REMEDIAL ALTERNATIVES FOR THE CHP

Remedial alternatives are different combinations of plans or technologies to restrict access, and to contain or treat contamination to protect human health and the environment. Several alternatives were considered as summarized below.

### Groundwater VOC Contamination:

- Presumptive or Proven Remedies
  - Air sparging with soil vapor extraction (AS/SVE)
  - Groundwater pump and treat
- Innovative Technologies
  - Enhanced In Situ Bioremediation
- Passive Remedies
  - Monitored natural attenuation
  - Monitoring only
- Land Use Controls (LUCs)

Several potentially applicable corrective measures for CHP were identified and screened in the CMS. Detailed information was presented concerning each potentially applicable corrective measure for contaminated groundwater.

## FINAL REMEDY

The final corrective measure for groundwater contaminated above cleanup levels is AS/SVE, and natural attenuation (monitoring of COCs only) will be used as a final polishing step.

**AS/SVE.** The AS/SVE system consists of air sparge wells used for injecting air into the groundwater and SVE wells for removing air from the unsaturated zone (i.e., above the water table). Since VOCs have a greater affinity for

air than water, the injected air strips the VOCs from the groundwater, and carries them to the unsaturated zone where they are removed by the SVE system. The AS/SVE system was installed with the groundwater plume area (Figure 3) as a pilot study. This area is largely paved such that injected air can easily be captured by the SVE system. The final remedy is to continue operating the pilot system and using monitored natural attenuation as a polishing step.

**Land Use Controls and Natural Attenuation with Long-Term Monitoring:** Natural processes such as biological degradation, dispersion, advection, and adsorption will reduce COC concentrations to cleanup levels over time. Groundwater will be regularly sampled and analyzed to monitor and document the decrease in contaminant concentrations. Data collected during the RFI indicated that natural attenuation mechanisms will likely reduce contaminant concentrations below cleanup levels. The RAOs will be achieved using a combination of AS/SVE and natural attenuation. The effectiveness of the system will be evaluated to determine if the remedies are effective or if system modifications are necessary.

In addition to active remediation, institutional controls will be implemented for site swale soil and groundwater. The institutional controls will maintain the site use so that the residential scenario developed in the PRE remains applicable and will also limit the use of groundwater as a drinking water source. NASA, EPA and FDEP have entered into a Memorandum of Agreement (MOA), which outlines how institutional controls will be managed at NASA.<sup>2</sup> The MOA requires periodic inspections, condition certification, and

2. By separate MOA effective February 23, 2001, with the EPA and FDEP, KSC, on behalf of NASA, agreed to implement Center-wide, certain periodic site inspections, condition certification, and agency notification procedures designed to ensure the maintenance by Center personnel of any site-specific LUCs deemed necessary for future protection of human health and the environment. A fundamental premise underlying execution of that agreement was that through the Center's substantial good faith compliance with the procedures called for herein, reasonable assurances would be provided to EPA and FDEP as to the permanency of those remedies which included the use of specific LUCs.

Although the terms and conditions of the MOA are not specifically incorporated or made enforceable herein by reference, it is understood and agreed by NASA KSC, EPA and FDEP that the contemplated permanence of the remedy reflected herein shall be dependent upon the Center's substantial good faith compliance with the specific LUC maintenance commitments reflected herein. Should such compliance not occur or should the MOA be terminated, it is understood that the protectiveness of the remedy concurred in may be reconsidered and that additional measures may need to be taken to adequately ensure necessary future protection of human health and the environment.

agency notification. The area of the site that will be under institutional control is shown on Figure 2.

### **EVALUATION OF REMEDY**

The selected remedy was evaluated to determine if it will comply with EPA's four threshold criteria and five balancing criteria for corrective measures. The four threshold criteria for corrective measures are:

- overall protection of human health and the environment;
- attain media cleanup standards;
- control the sources of releases; and
- comply with standards for management of wastes.

The five balancing criteria are:

- long term reliability and effectiveness;
- reduction in the toxicity, mobility or volume of wastes;
- short term effectiveness;
- implementability; and
- cost.

The AS/SVE system followed by continued Land Use Controls and Natural Attenuation with Long-Term Monitoring meet each of the threshold criteria and was determined by the KSC Remediation Team to be the best overall approach.

### **WHAT IMPACTS WOULD THE REMEDY HAVE ON THE LOCAL COMMUNITY?**

There would be no impacts to the local community because groundwater is not used for potable water at KSC. The AS/SVE alternative includes administrative actions to limit the use of groundwater until the cleanup levels have been reached.

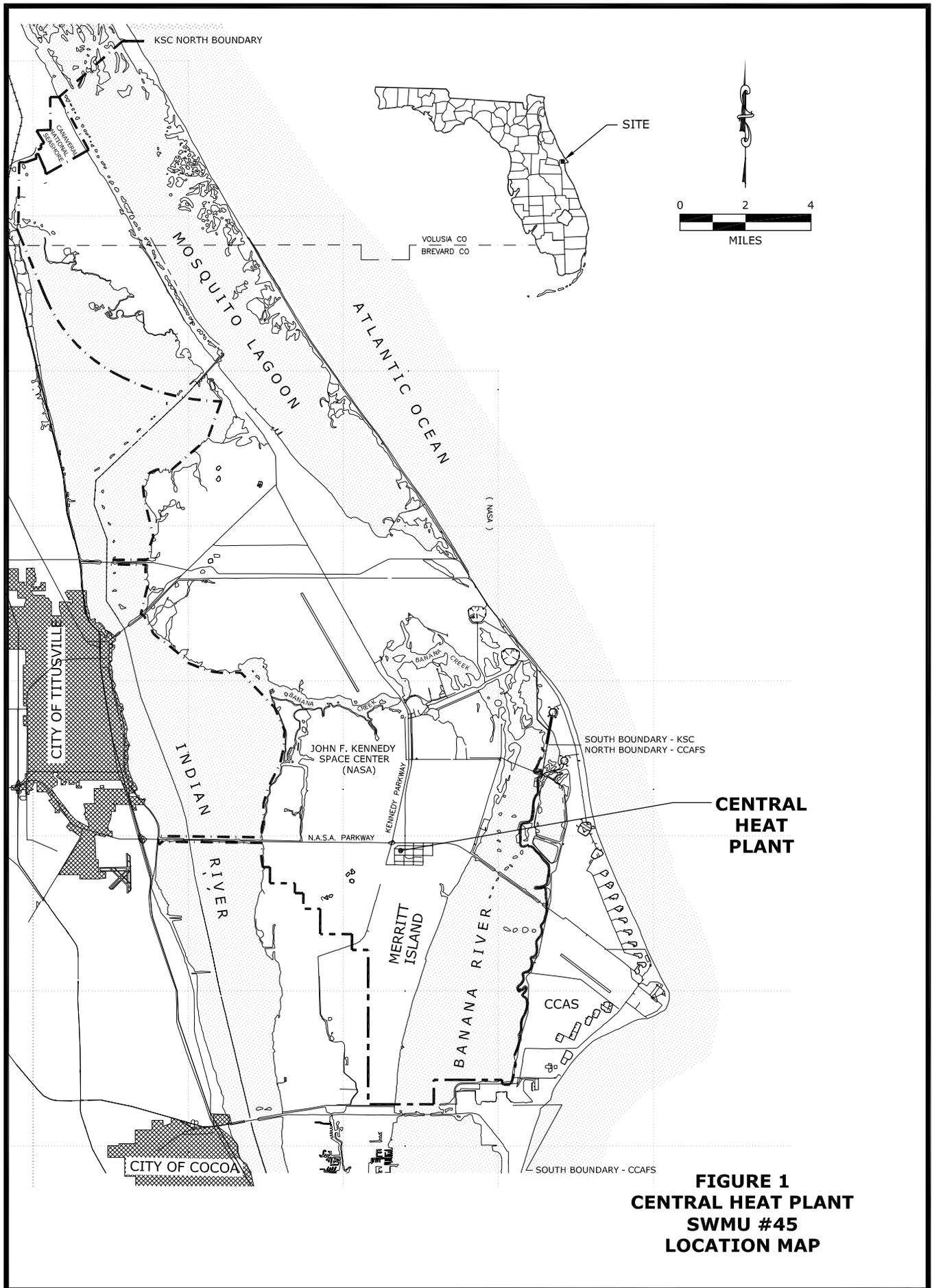
### **WHY DOES THE KSC REMEDIATION TEAM RECOMMEND THIS REMEDY?**

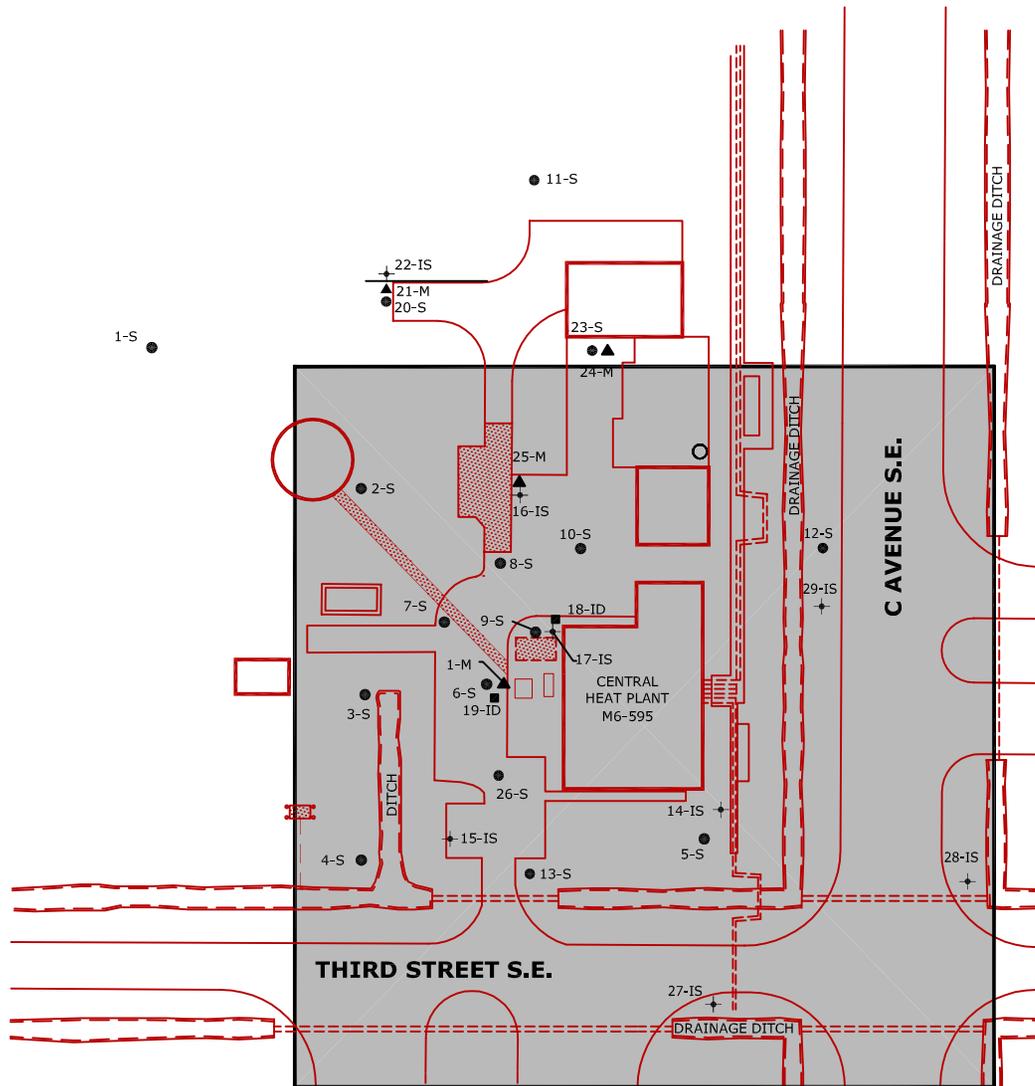
The team recommends the proposed remedy because AS/SVE is a cost effective means to

remediate/control groundwater in a reasonable amount of time. The long-term monitoring will be used to monitor and document reduction in contamination concentrations to the cleanup goals. The institutional controls will also prevent exposure to contaminants prior to the cleanup levels being achieved. The proposed remedy meets the four general standards for corrective measures and was determined to be the best overall approach.

### **NEXT STEPS**

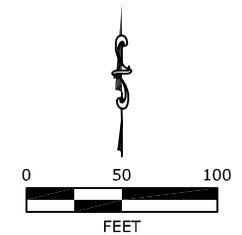
The KSC Remediation Team will review all comments on this SB to determine if the proposed remedy needs modification prior to implementation and prior to incorporating the proposed remedy into KSC's HSWA permit. If the proposed remedy is determined to be appropriate for implementation, then a long term monitoring program will be initiated, and a Land Use Control Implementation Plan will be developed to incorporate the institutional controls at this site.



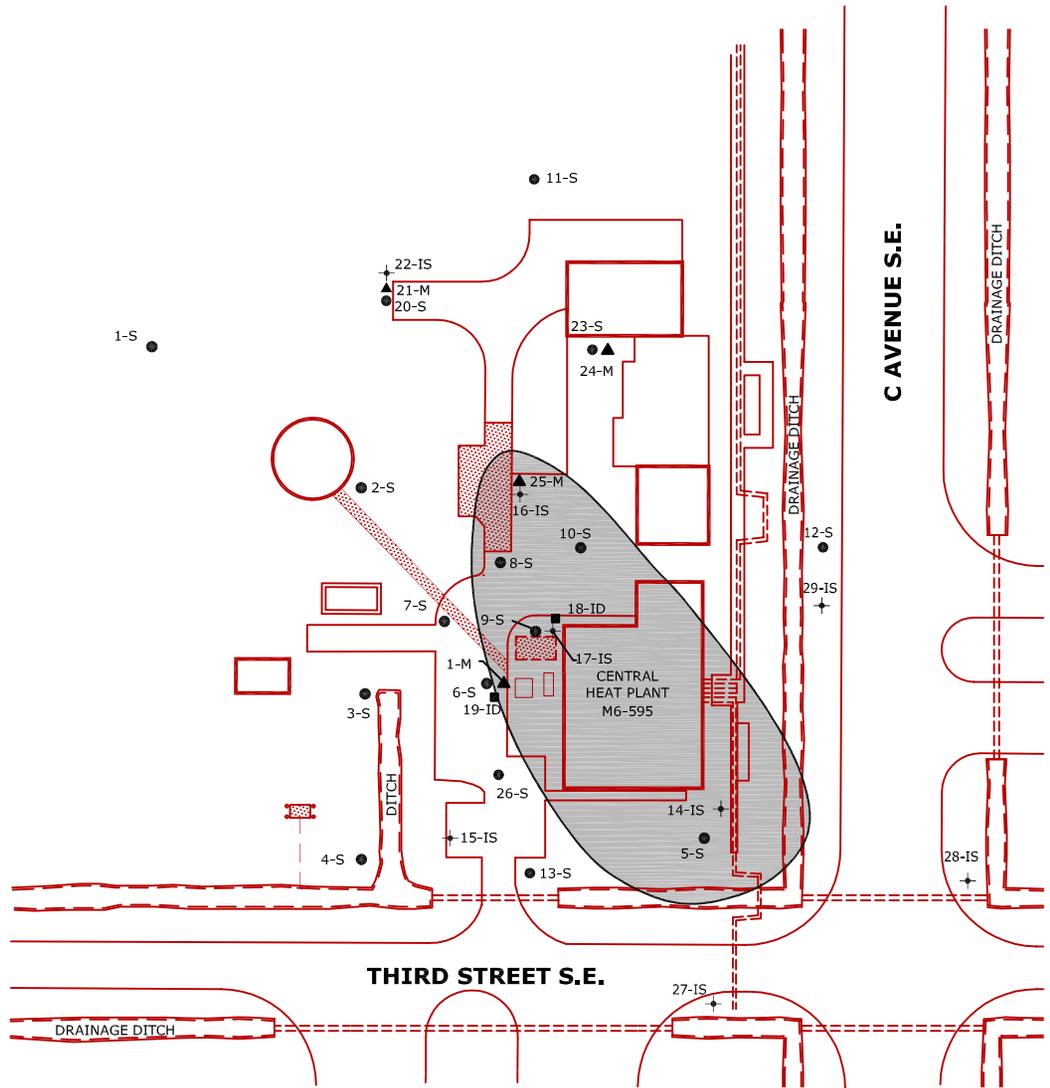


### EXPLANATION

- 2-S ● SHALLOW MONITOR WELL (±13 ft.)
- 21-M ▲ MEDIUM-SHALLOW MONITOR WELL (±30 ft.)
- 17-IS + INTERMEDIATE-SHALLOW MONITOR WELL (±45 ft.)
- 18-ID ■ INTERMEDIATE-DEEP MONITOR WELL (±85 ft.)
- AREA COVERED BY STATEMENT OF BASIS AND SOIL AND GROUNDWATER USE CONTROL AREA
- UNDERGROUND STORM DRAIN PIPE

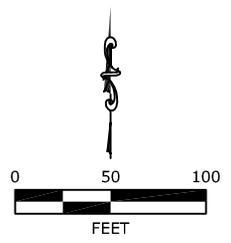


**FIGURE 2  
FACILITY MAP  
CENTRAL HEAT PLANT  
SMWU #45**



**EXPLANATION**

- 2-S ● SHALLOW MONITOR WELL (±13 ft.)
- 21-M ▲ MEDIUM-SHALLOW MONITOR WELL (±30 ft.)
- 17-IS + INTERMEDIATE-SHALLOW MONITOR WELL (±45 ft.)
- 18-ID ■ INTERMEDIATE-DEEP MONITOR WELL (±85 ft.)
-  APPROXIMATE AS/SVE AREA
- ===== UNDERGROUND STORM DRAIN PIPE



**FIGURE 3  
CENTRAL HEAT PLANT  
SWMU #45  
PROPOSED GROUNDWATER  
REMEDATION TECHNOLOGY**