STATEMENT OF BASIS

HYPERGOL MAINTENANCE FACILITY HAZARDOUS WASTE SOUTH STAGING AREAS SWMU 70 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 Hypergol Maintenance Facility (HMF) Hazardous Waste South Staging Areas.[1] A Kennedy Space Center (KSC) Remediation Team consisting of National Aeronautics and Space Administration (NASA) 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 aluminum and organic constituents (trichlorofluoromethane (TCFM) and vinyl chloride (VC)), were detected in groundwater at concentrations exceeding the FDEP Groundwater Cleanup Target Levels (GCTLs). Table 1 lists the constituents 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 HMF will eventually be incorporated into the Hazardous and Solid Waste Amendments (HSWA) Permit for Kennedy Space Center (KSC).

The Cleanup Remedy

The proposed cleanup remedy for the HMF includes:

- Air Sparging to treat groundwater by injecting air below the water table to increase the flux of dissolved TCFM into the gas phase in the unsaturated zone;
- Monitored natural attenuation of groundwater to document water quality and contaminant levels; and
- Implementation of institutional controls to prohibit the use of groundwater as a potable water suppy.

The public comment period for this SB and proposed remedy will begin on the date of

1. *In accordance with RCRA §7004(b), this Statement of Basis summarizes the proposed remedy for the NASA HMF. For detailed information on the site, consult the HMF RFI 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.*

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 R. 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
Telephone: (321) 867-8411

Mr. John R. Armstrong, P.G.
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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, KSC was required to perform an investigation to determine the nature and extent of contamination from Solid Waste Management Unit (SWMU) No. 70, the HMF.

SITE DESCRIPTION AND HISTORY

The HMF is a NASA-operated facility that was constructed between 1964 and 1985 to support the Apollo and Shuttle Space Programs at KSC; however, most of the buildings were constructed in 1964. The HMF is located in the southeast portion of the KSC Industrial Area (Figure 1). The HMF Facility includes the East Hypergol Module Storage Building, West Hypergol Module Storage Building, Hazardous Waste Staging Shelter, Hazardous Waste Staging Area (formerly the Liquid Oxygen Fuel Pad), former Liquid Hydrogen Fuel Pad, two leaching ponds, and two equipment shelters. These buildings and structures comprise an area of approximately 8 acres.

Past operations at the HMF include cryogenic testing for the Apollo Space Program and “hot-testing” of the Solid Rocket Booster Aft Skirt. In addition, from 1981 to 1998, the Hazardous Waste Staging Area operated as a permitted RCRA Temporary Storage and Disposal (TSD) facility. The TSD was closed in 1998. The facility is currently inactive and used for the storage of miscellaneous equipment.

Investigations conducted at the site include:

- 1997 – 1998: In November 1997, soil, rinsate, and groundwater samples were collected during closure activities at the TSD area. No constituents were present in the groundwater or soil samples above KSC screening criteria. Several metals in the rinse water samples were above KSC screening criteria. Since the concentrations in the rinse water were below hazardous levels, and the

groundwater sample showed no exceedances of maximum contaminant levels (MCLs), a Closure Certification was awarded in 1998, which recommended no further action.

- 1998: A RCRA Facility Assessment (RFA) was conducted to evaluate potential sources of contamination at the site. Based on the RFA, Confirmation Sampling (CS) was recommended.

- 1999: As part of the CS, soil and groundwater samples were collected and analyzed. The primary surface soil contaminants were PCBs (Aroclor 1254 and Aroclor 1260), which exceeded the industrial and residential SCTLs. Volatile organic compounds, such as TCFM, and aluminium were detected above the GCTLs.

- 2002: During the RCRA Facility Investigation (RFI), soil and groundwater samples were collected and analyzed. Results of the RFI indicated that PCB contamination in soil was limited to two small areas and no groundwater plume was discernable, although several VOCs, aluminum, iron, and vanadium exceeded the GCTLs. Results of these analyses were used to evaluate potential risks to human health and ecological receptors. An Interim Measure (IM) for soil to address PCBs was recommended. The Preliminary Risk Evaluation (PRE) for human health indicated that groundwater containing VOCs, would result in an unacceptable human health risk if the groundwater was used as a source of drinking water. The ecological risk assessment (ERA) indicated that no unacceptable risk exists at the site for ecological receptors.

- 2003: The IM was performed to remove soils impacted by PCBs. Approximately 200 tons of soil was removed. Post-IM human health risks for soil were below the FDEP residential threshold.

- 2003: Monitoring well FWT-IW3S from the Firex Water Tank Site was incorporated into the Hypergol Maintenance Facility (SWMU #70) Corrective Measures Study to address iron.

- 2004: Based on the Hypergol Payload/Test Area Groundwater Iron Evaluation, iron was removed as a chemical of concern at Hypergol Maintenance Facility (SWMU #70) and the Firex Water Tank (SWMU #69)

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, and aluminum in groundwater. COCs in groundwater are presented in Table 1. The PRE for human health indicated that groundwater containing VOCs would result in unacceptable human health risk if the groundwater was used as a source of drinking water. After implementation of the IM, no COCs were identified for soil.

The ERA did not identify any unacceptable ecological risks.

WHAT ARE THE REMEDY OBJECTIVES AND LEVELS?

The remedial action objective (RAO) is to treat the groundwater to cleanup levels specified in Table 1 and to limit the site to industrial uses and protect humans from exposure to groundwater by preventing its use as a drinking

water source in the shallow aquifer where contaminant concentrations are higher than regulatory standards.

Table 1 lists the COCs present in groundwater at the HMF. The first column lists the chemical name, the second column lists the range of concentrations in groundwater detected at the HMF during the RFI, and the last column presents the FDEP/EPA cleanup target level to be achieved at the site.

Table 1

Site-Related Chemicals of Concern (COCs)	Range of Detections[1] (µg/L)	Site-Specific Cleanup Level[2] (µg/L)
Trichlorofluoromethane	2.6 – 500,000	2100
Vinyl Chloride	4.2 - 160	1
Acetone	1,000 – 1,300	700
Aluminum	74 – 9,700	1,300

[1] Detections in monitoring wells
[2] Cleanup levels are GCTLs from Florida Administrative Code 62-777 (Aluminum is KSC background values)

REMEDIAL ALTERNATIVES FOR THE HMF

The RFI performed for the HMF Facility identified groundwater ingestion as the principal exposure pathway and medium of concern in the area. The alternatives evaluated for the VOC plume, specifically TCFM, were groundwater Extraction and Treatment and Air Sparging. Based upon the detailed evaluation of these technologies, air sparging was selected for remediation of the TCFM plume. Monitored Natural Attenuation (MNA) was selected as the presumptive remedy for monitoring groundwater impacted by aluminum above upper range of KSC Background values and VC above the GCTL.

For both remedies, groundwater will be regularly sampled and analyzed to monitor and document the decrease in contaminant concentrations. In addition, institutional controls will be implemented for site groundwater. The institutional controls will 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[2]. The MOA requires periodic inspections, condition certification, and agency notification. The area of the site that will be under institutional control is shown on Figure 2.

EVALUATION OF REMEDIES

The selected remedies were evaluated to determine if they will comply with EPA's four threshold 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.

Air Sparging with MNA meet each of the threshold criteria and was determined by the KSC Remediation Team to be the best overall approach.

FINAL REMEDY

The final corrective measure for groundwater is Air Sparging for the TCFM plume and MNA for aluminum, and VC impacts. Figure 3 shows the approximate location of the Air Sparging area for the site.

***Air Sparging**:* Air sparging is a process where air is injected below the water table in an attempt to increase the flux of dissolved VOCs into the gas phase in the unsaturated zone, where the constituents can be recovered or released to the atmosphere. Vertical or horizontal wells can be used and must be placed close enough to produce sufficient air flow to promote volatilization throughout the treatment zone. The air sparging approach proposed for the HMF involves the installation of wells throughout the TCFM plume footprint. The anticipated duration of air sparging is anticipated to be less than one year, due to the high volatility of TCFM and elevated GCTL of 2,100 µg/L (in contrast to VC, which has a GCTL of 1 µg/L). Since the duration is limited, the installation of the air sparging system would consist of temporary aboveground piping runs, and a temporary enclosure to facilitate placement of trailer or skid-mounted equipment.

Monitored Natural Attenuation: MNA entails the use of natural processes (chemical, physical, and biological) to reduce VOC concentrations. Chemical MNA processes include volatilization, sorption, and hydrolysis. Physical MNA processes include dilution due to infiltration, advection, and dispersion. Biological MNA processes include biological consumption due to electron acceptor reactions (reductive dehalogenation), electron donor reactions, and cometabolism. All of these processes combine to reduce chlorinated VOC concentrations over time.

Institutional Controls: In addition to air sparging and MNA, institutional controls will be implemented for site groundwater, prohibiting the use of groundwater as a potable water supply.

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 Air Sparging with MNA 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:

- Air Sparging activities can be readily implemented without significant disruption to the site (e.g. excavation, trenching, etc.), thus reducing the potential exposure to COCs;
- Air Sparging does not create potential exposure risks associated with bringing contaminated groundwater to the surface where human exposure and/or releases to the environment can occur;
- Air Sparging provides a rapid reduction in TCFM concentrations, thus controlling sources of releases;
- Air Sparging helps control the dissolved COC flux, thus reducing human health risks arising from the potential exposure to COCs;
- MNA will be used to monitor and document reduction in aluminum concentrations to KSC Background Levels and VC concentrations to the cleanup target level because the naturally-occurring processes observed at the site are sufficient for the removal of low concentrations of VOCs; and
- 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.

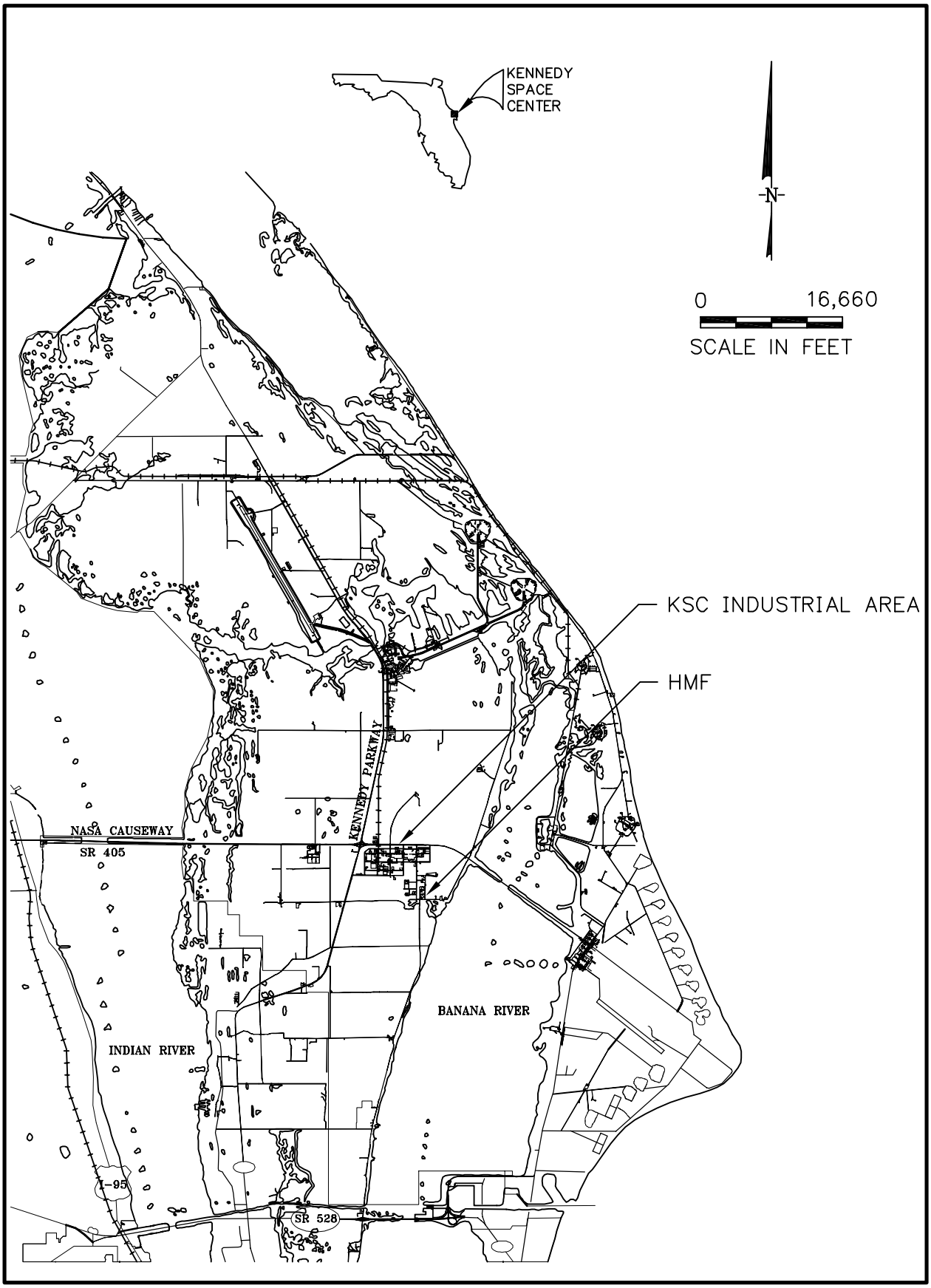
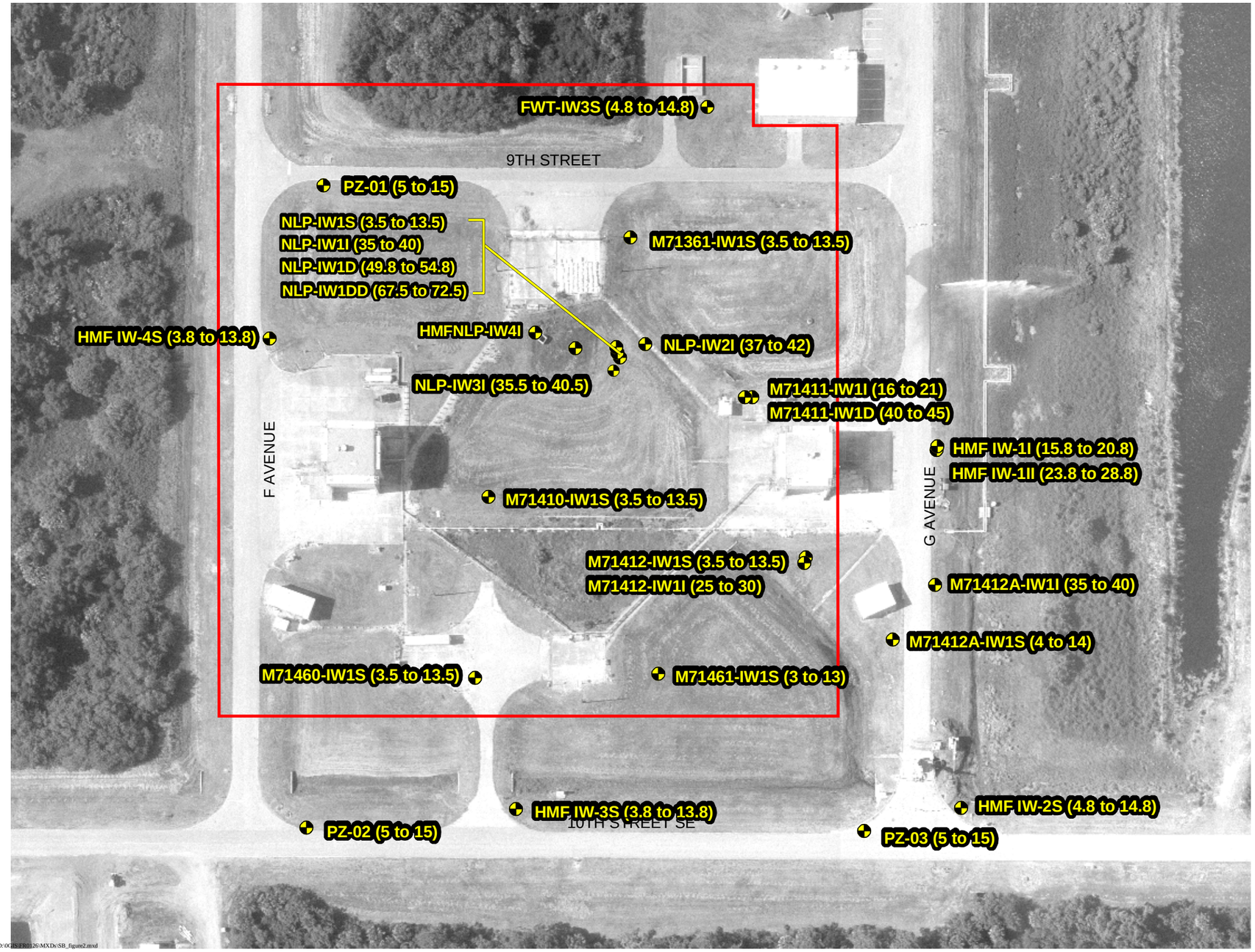


FIGURE 1
HMF Facility (SWMU 70)
Location Map



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LEGEND

Monitoring Well Location (well screen interval in ft. BLS)

Area Covered by Statement of Basis and Groundwater Use Control

Note:
BLS = below land surface

Figure 2
Site Map of the HMF (SWMU 70) Area

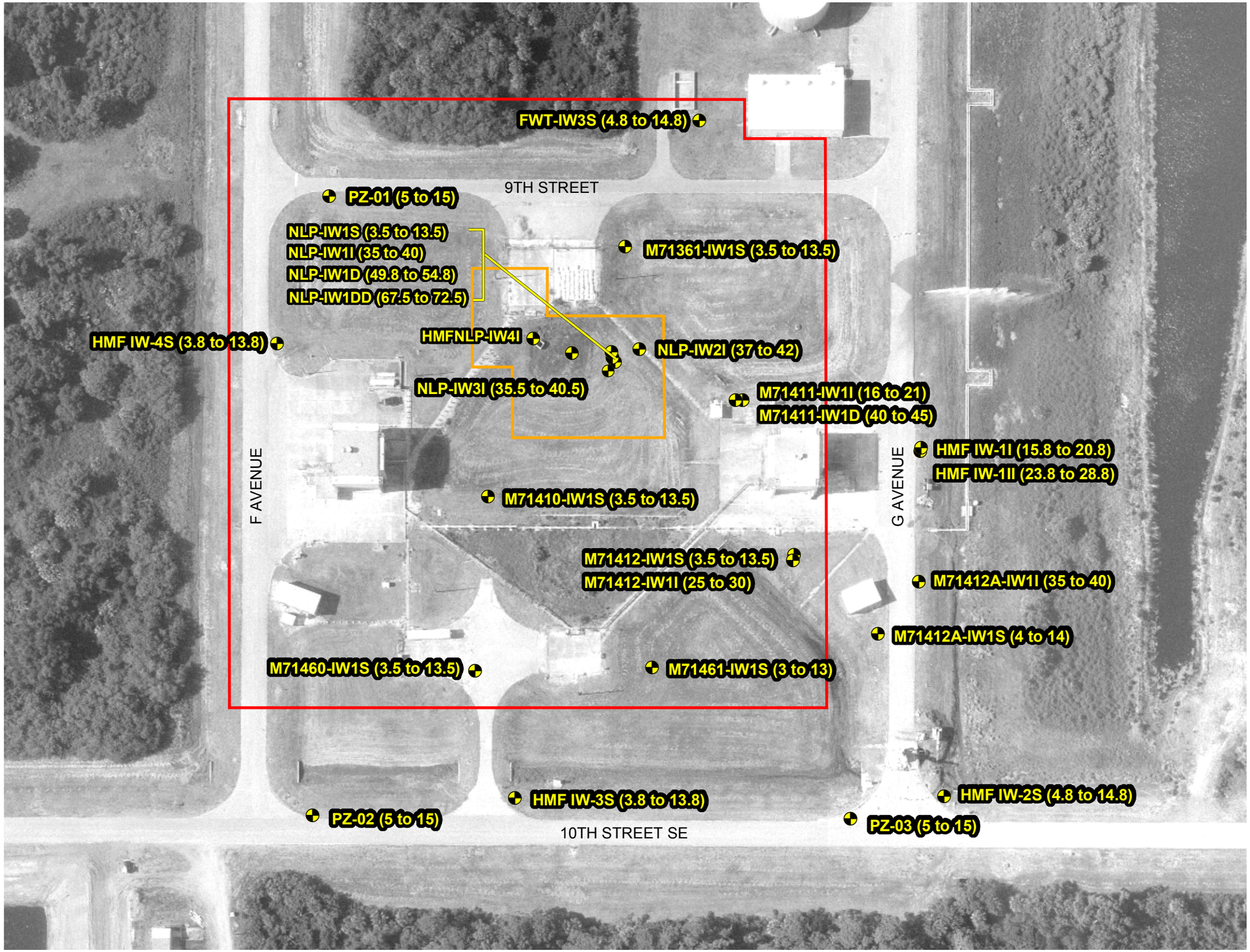

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Figure 3
HMF (SWMU 70) Remedial Technology Treatment Area