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TREATABILITY STUDY FOR SOLID WASTE MANAGEMENT UNIT 9 REVISION 1 NAS KEY WEST FL

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TREATABILITY STUDY INSTALLATION REPORT FOR SWMU 9

Naval Air Station
Key West, Florida

Southern Division
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0007

March 2001

Rev. 1

AIK-01-0089
Rev. 1

TREATABILITY INSTALLATION REPORT FOR SWMU 9

NAVAL AIR STATION KEY WEST, FLORIDA

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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Naval Facilities Engineering Command
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MARCH 2001

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ACRONYMS

AST	aboveground storage tank
bgs	below ground surface
CLEAN	Comprehensive Long-Term Environmental Action, Navy
CTO	Contract Task Order
DCE	dichloroethene
DPT	direct push technology
HRC®	Hydrogen Releasing Compound
JP-5	jet propellant fuel
µg/L	micrograms per liter
NAS	Naval Air Station
ORC®	Oxygen Releasing Compound
®	registered trademark of Regenesis Bioremediation Products, Inc.
SVOC	semi-volatile organic compound
SWMU	Solid Waste Management Unit
TCE	trichloroethene
TtNUS	Tetra Tech NUS
VOC	volatile organic compound

1.0 INTRODUCTION

This Treatability Study Installation Report was prepared by Tetra Tech NUS, Inc. (TtNUS) under the Comprehensive Long-Term Environmental Action, Navy (CLEAN) Contract No. N62472-94-D-1888, Contract Task Order (CTO) 0007. The report describes activities involved in applying enhanced biodegradation technologies at Solid Waste Management Unit (SWMU) 9, the Former Jet Engine Test Cell at the Naval Air Station (NAS) Key West, Florida.

This report will describe injection of Oxygen Releasing Compound (ORC®) and Hydrogen Releasing Compound (HRC®) into benzene and chlorinated hydrocarbon source areas at SWMU 9. Any deviations from the Enhanced Biodegradation Treatability Study Work Plan for SWMU 9 (TtNUS, 2000) are documented in this report as well.

1.1 DOCUMENT ORGANIZATION

Section 1.0 of this report contains the Introduction, a brief Site Description, Site History, and Site Investigation Summary. Additional information is contained in the Enhanced Biodegradation Treatability Study Work Plan for SWMU 9 (TtNUS, 2000) and the Corrective Measures Study for SWMU 9 (TtNUS, 1999). Section 2.0 presents a description of the ORC® Injection, HRC® Injection, and Deviations from the Work Plan. Appendix A contains response(s) to comments. Documentation for deviating from the work plan (changing the amount of HRC® injected during the installation process) is included as Appendix B. Daily activity logs from the field effort are in Appendix C.

1.2 SITE DESCRIPTION

SWMU 9, the Former Jet Engine Test Cell site (associated with Building A-969) is located in the eastern portion of the Boca Chica Airfield (Figure 1-1). Two areas at the site were used for jet engine testing. The most recent jet engine testing area was under a canopy in the middle of a circular concrete pad (approximately 60 feet in diameter) in the central part of the site (Figure 1-2). The concrete area that extends northeast of the canopy was the former jet engine testing area. Jet blast deflectors are located at the ends of two concrete pads that connect with the north and northeast portions of the circular concrete pad. Building A-969 was located 50 feet southeast of the testing area. A small shed at the eastern end of the concrete pad was used to store various equipment, oils, and jet fuel. Gas path cleaners, presumably ketones and trichloroethene (TCE), were also stored on the eastern side of the shed. An asphalt parking area extends from these structures to the asphalt road. In addition, a switch house,

compressed air tanks, a voltage box, and a bermed area that formerly contained a 5,000-gallon aboveground storage tank (AST) used to store jet propellant fuel (JP-5) are located adjacent to the southwestern edge of the circular pad. The entire area is flat, open, and covered with grass in areas where it is not paved. The site is bordered to the south by an asphalt road that parallels a runway and to the east and west by grassy areas. A lagoon is located north of the site, approximately 250 feet from the location of the canopy. A narrow strip of red mangroves is located along the shoreline of the lagoon.

1.2.1 SITE HISTORY

Beginning in 1969, the SWMU 9 site was used for testing repaired jet engines. These engines were fueled with JP-5 fuel from the bermed 5,000-gallon AST that was in use from 1987 through 1995. Organic solvents (ketones and TCE) were reportedly used to clean jet engines and the engine test areas. No other known activities have been conducted near the site.

Two documented spills have occurred at the Former Jet Engine Test Cell. In January 1989, a filter fuel system leak resulted in the release of approximately 700 gallons of JP-5 fuel on the western side of the AST at SWMU 9. Approximately 600 gallons were recovered by pumping free product during initial remediation activities. Following the free product recovery, 10 cubic yards of contaminated soil were excavated and removed from the spill site. The second spill involved an overturned lubrication oil drum adjacent to the northwest edge of the circular pad in November 1992. Stained soil was observed in a small area. Presumably, contamination from this spill was removed shortly after its discovery (ABB, 1994).

1.2.2 SITE INVESTIGATION SUMMARY

Fuels, oils, and solvents stored at SWMU 9 are potential sources of contamination. Volatile organic compound (VOC) and semi-volatile organic compound (SVOC) fuel constituents have been detected in groundwater. Chlorinated VOCs are the most frequently detected groundwater contaminants, although they are not components of jet fuel. No documentation of solvent spills exists; however, the chlorinated VOCs probably came from solvents used for cleaning and degreasing at the site.

Several investigations have taken place at SWMU 9 since 1993. A pump and treat system was installed in 1996 to provide recovery and treatment of groundwater impacted by chlorinated solvents. The system operated for one year, but did not recover any free product (BEI, 1998). These investigations and the remedial action are discussed in detail in the Enhanced Biodegradation Treatability Study Work Plan for SWMU 9 (TtNUS, 2000) and in the Corrective Measures Study Report for SWMU 9 (TtNUS, 1999).

Groundwater sampling was most recently performed in April 2000 to define baseline conditions for the Enhanced Biodegradation Treatability Study. Detailed results of this sampling event are presented in the Enhanced Biodegradation Treatability Study Work Plan (TtNUS, 2000). The primary concerns at SWMU 9 are: 1) a chlorinated solvent plume with the maximum total dichlorethene (DCE) concentration of 12,800 micrograms per liter (μg/L) centered at monitoring well S9MW-15; and 2) a petroleum product plume surrounding monitoring well S9MW-5 with a maximum benzene concentration of 10 μg/L.

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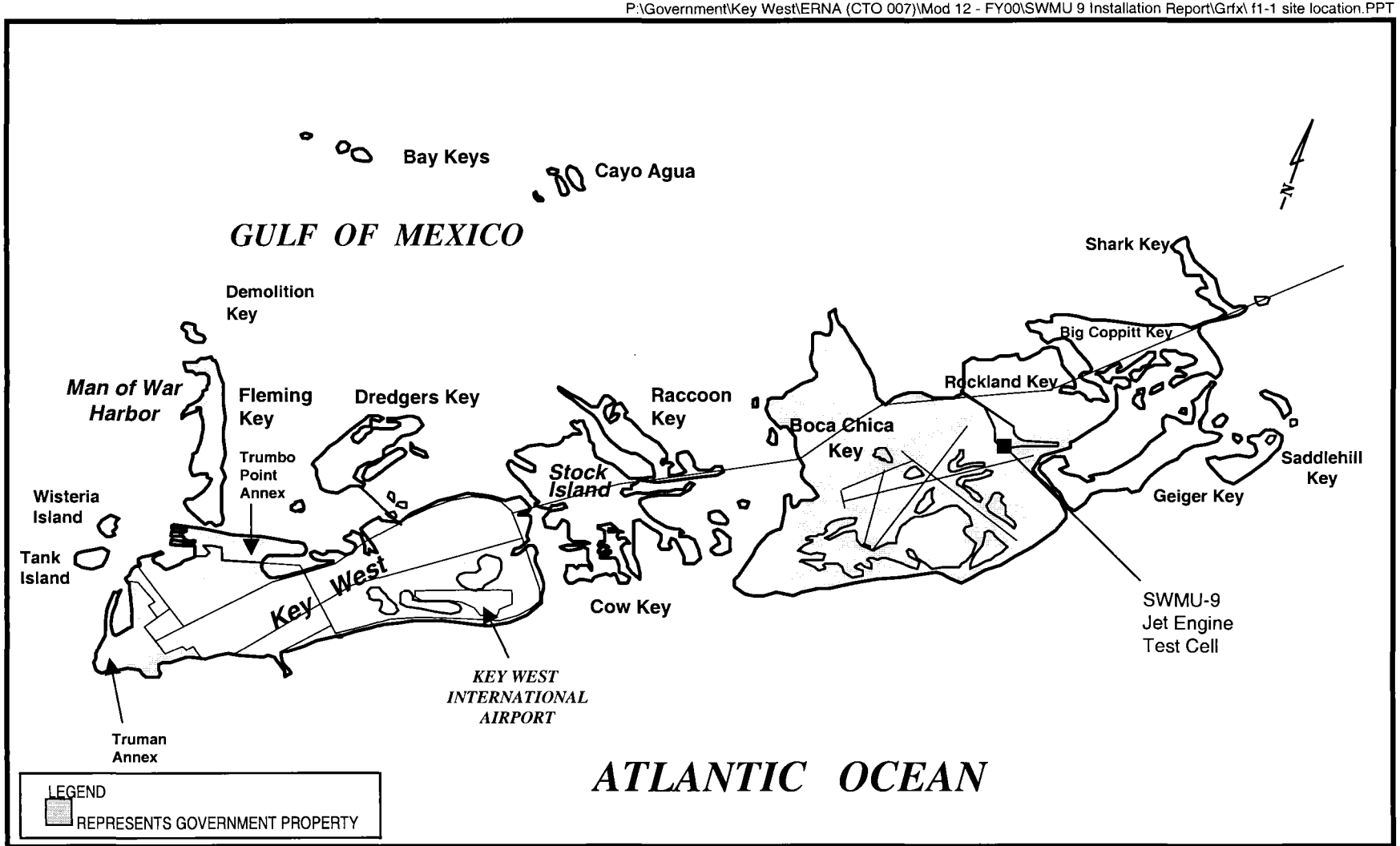

DRAWN BY MDB	DATE ----	SWMU 9 TREATABILITY STUDY INSTALLATION REPORT FIGURE 1-1. SWMU 9 SITE LOCATION NAVAL AIR STATION KEY WEST, FLORIDA	CONTRACT NO. 7046
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COST/SCHED-AREA			APPROVED BY — DATE
SCALE AS NOTED			DRAWING NO. — REV. 0

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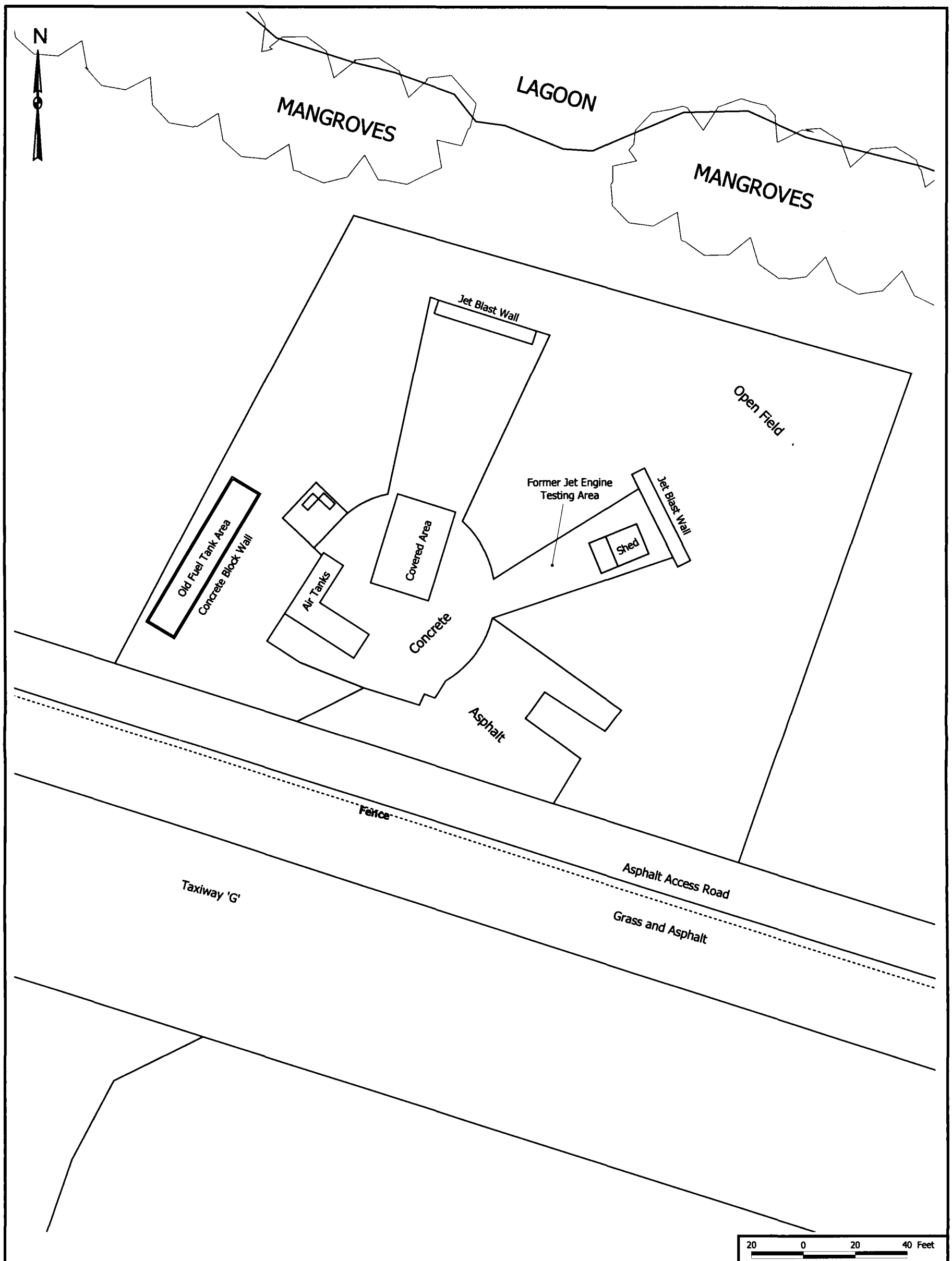

NO.	DATE	REVISIONS	DRAWN BY	DATE	SWMU 9 TREATABILITY STUDY	CONTRACT NO.
			CM	2/5/2001	INSTALLATION REPORT	7046
			CHECKED BY	DATE	FIGURE 1-2	APPROVED BY / DATE
			EH	2/5/2001	SWMU 9 SITE MAP	CMB / 02/09/01
			COST/SCHED-AREA		NAVAL AIR STATION	APPROVED BY / DATE
			SCALE		KEY WEST, FLORIDA	DRAWING NO. / REV.
			AS NOTED			0

P:/GOVERNMENT/KEYWEST/EGIS/SWMU9 TSI REPORT.APR LAYOUT: FIG 1-2
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2.0 ORC®/HRC® INJECTION

ORC® and HRC® injection activities took place from January 16 through 25, 2001. Direct-push technology (DPT) was used to install injection points to a depth of 12 feet below ground surface (bgs), when possible. The ORC® and HRC® products were injected throughout the 10-foot saturated zone (2 to 12 feet bgs).

2.1 ORC® INJECTION

ORC® was injected (using DPT) into the petroleum source area located under the circular concrete pad. DPT borings were initially advanced using a 1.5-inch pre-probe with an expendable tip and a 1-inch Geoprobe rod for ORC® injection. The 16 ORC® injection points required concrete coring through the circular concrete pad. The thickness of the concrete ranged from 0.5 to 1.0 feet. All ORC® injection points were advanced to a depth of 12 feet bgs.

A total of 330 pounds of ORC® was injected into the subsurface in the petroleum source area. The ORC® powder was shipped to the site in 5-gallon buckets, with each bucket containing 30 pounds of ORC®. Approximately 20 pounds of ORC® were mixed with 3 gallons of water and injected throughout the saturated zone (2 to 12 feet bgs) at each of the 16 injection points. The injection points were placed on 10-foot centers as shown in Figure 2-1. The ORC® slurry was mixed by hand in buckets, and then continuously stirred after it was poured into the pump hopper. The ORC® slurry was injected at a constant rate to achieve the most uniform possible distribution across the 10-foot interval. Injection points were filled with grout above the ORC® slurry to the ground surface.

The 16 ORC® injection points are shown in Figure 2-1. All injection points accepted the specified 20 pounds of ORC®, although small amounts of slurry were observed to seep from the tops of the borings at some points.

2.2 HRC® INJECTION

HRC® was injected (using DPT) into the chlorinated solvent plume. DPT borings were advanced using a 1.5-inch pre-probe with an expendable tip and a 1.25-inch Geoprobe rod for HRC® injection. A rod was dropped in injection point 51, forcing a switch to a 2-inch pre-probe with an expendable tip and a 1.5 inch Geoprobe rod for injection at the remaining 18 HRC® injection points. A total of 67 HRC® injection points

on 10-foot centers were completed. The majority of the borings reached 12 feet bgs. Repeated refusal was encountered at several points, resulting in a boring depth of less than 12 feet bgs at four injection points (see Table 2-1). Eleven of the injection locations required coring through 0.5 to 1.0 feet of concrete.

Following production of the Enhanced Biodegradation Treatability Study Workplan for SWMU 9 (TtNUS, 2000), further consultation was sought from Regenesis Bioremediation Products, Inc., developer and manufacturer of ORC® and HRC®, concerning the amount of HRC® required for treatment of the chlorinated solvents plume. The original estimate was based on the maximum DCE concentration for the entire plume and was extremely conservative. Regenesis recommended injecting a significantly smaller amount of HRC® than was described in the Treatability Study Work Plan (TtNUS, 2000). Regenesis advised using approximately 3,840 pounds of HRC® at 64 injection points (60 pounds per point), as opposed to the 16,632 pounds of HRC® at 66 injection points (252 pounds per point) recommended in the Work Plan (TtNUS, 2000). This proposal from Regenesis is included in Appendix B. A Field Task Modification Request Form (see Appendix B) was completed and approved and 60 pounds of HRC® was planned for injection into each of 64 holes.

The HRC® gel was shipped in 5-gallon buckets, each containing 30 pounds of HRC®. Therefore, two buckets of HRC® gel were injected into each boring. Due to varying lithology at the site, a number of injection points would not accept the specified 60 pounds of HRC®. Following consultation with Regenesis, TtNUS concluded that, if borings would accept more than 60 pounds of HRC®, as much HRC® as possible would be injected at those locations in order to compensate for those borings that would not accept the required amount. HRC® injection amounts ranged from 30 to 90 pounds per injection point, with the majority of the injection points accepting the planned 60 pounds per hole. As with the ORC® slurry, the HRC® small amounts of gel were observed to seep from the tops of the borings at a number of points. Three injection points were installed, in addition to the 64 recommended by Regenesis, for a total of 67 points. A total of 3,660 pounds of HRC® was injected into the chlorinated hydrocarbon plume at SWMU 9.

The HRC® gel was injected at a constant rate to achieve the most uniform distribution possible across the 10-foot interval. Injection points were filled with grout above the HRC® gel to the ground surface. Because HRC® injection points had varying depths and HRC® quantities, the points were numbered for purposes of recording specific data at each injection point. Table 2-1 lists all HRC® injection point depths, amounts of HRC®, and the number of DPT attempts at each injection point number. Locations of all injection points are shown on Figure 2-2.

2.3 DEVIATIONS FROM THE WORKPLAN

As discussed previously, the amount of HRC® required for treatment of the chlorinated solvents plume was re-evaluated following submission of the Enhanced Biodegradation Treatability Study Work Plan (TtNUS, 2000). The recommendation from Regenesis specified injecting 60 pounds of HRC® into each of 64 injection points. The design proposal from Regenesis along with the Field Task Modification Request Form are contained in Appendix B.

A second deviation from the plan was caused by varying lithology within the site. Injection of 60 pounds of HRC® into each boring was not possible. Therefore, the lack of the specified 60 pounds of HRC® in some borings was compensated for in others, to the extent possible. Injection amounts for each HRC® injection point are specified in Table 2-1. The lithology of the site also caused several DPT boring refusals. Four injection points were not completed to the desired 12-foot depth instead, reaching depths ranging from 8 to 11 feet.

As mentioned, the planned 60 pounds of HRC® per injection point could not be achieved in all cases. Although increased amounts of HRC® were injected into borings when possible, the planned total amount of HRC® was not injected. Three injection points were installed in addition to the planned 64 points, for a total of 67 injection points. However, only 3,660 pounds of the planned 3,840 pounds of HRC® were injected into the chlorinated solvent plume at SWMU 9.

2.4 MONITORING

Quarterly monitoring at SWMU 9 will begin approximately three months following the ORC®/HRC® injection. Laboratory and field analyses to be performed are discussed in Section 4.0 of the Enhanced Biodegradation Treatability Study Work Plan (TtNUS, 2000). Following the first quarterly monitoring event, a letter will be issued to report the results.

TABLE 2-1

HRC® INJECTION DEPTHS, AMOUNTS, AND REFUSALS
NAVAL AIR STATION
KEY WEST, FLORIDA
PAGE 1 OF 2

Injection Point	Depth (ft)	Amount of HRC® (lbs)	Number of Attempts
1	12	35	0
2	12	60	0
3	12	30	0
4	12	60	0
5	12	35	0
6	12	60	0
7	8	60	0
8	12	45	0
9	10	30	0
10	12	35	0
11	12	35	0
12	12	60	0
13	12	60	0
14	12	60	5
15	12	45	0
16	12	60	0
17	12	45	0
18	12	75	0
19	9	60	1
20	12	45	1
21	12	35	0
22	12	35	0
23	12	60	0
24	12	90	0
25	12	60	0
26	12	60	0
27	12	60	0
28	12	60	0
29	11	60	1
30	12	60	0
31	12	50	0
32	12	60	0
33	12	60	0
34	12	40	0
35	12	40	0
36	12	80	0
37	12	60	0
38	12	60	0
39	12	35	0
40	12	60	0
41	12	60	0
42	12	85	0

TABLE 2-1

HRC® INJECTION DEPTHS, AMOUNTS, AND REFUSALS
NAVAL AIR STATION
KEY WEST, FLORIDA
PAGE 2 OF 2

Injection Point	Depth (ft)	Amount of HRC® (lbs)	Number of Attempts
43	12	55	0
44	12	60	0
45	12	58	0
46	12	62	0
47	12	30	0
48	12	60	0
49	12	55	0
50	12	30	0
51	12	60	0
52	12	60	0
53	12	40	0
54	12	60	0
55	12	60	0
56	12	60	0
57	12	35	0
58	12	60	0
59	12	60	0
60	12	60	0
61	12	60	0
62	12	60	0
63	12	60	0
64	12	70	0
65	12	60	0
66	12	60	0
67	12	60	1
TOTAL		**3660**	**9**

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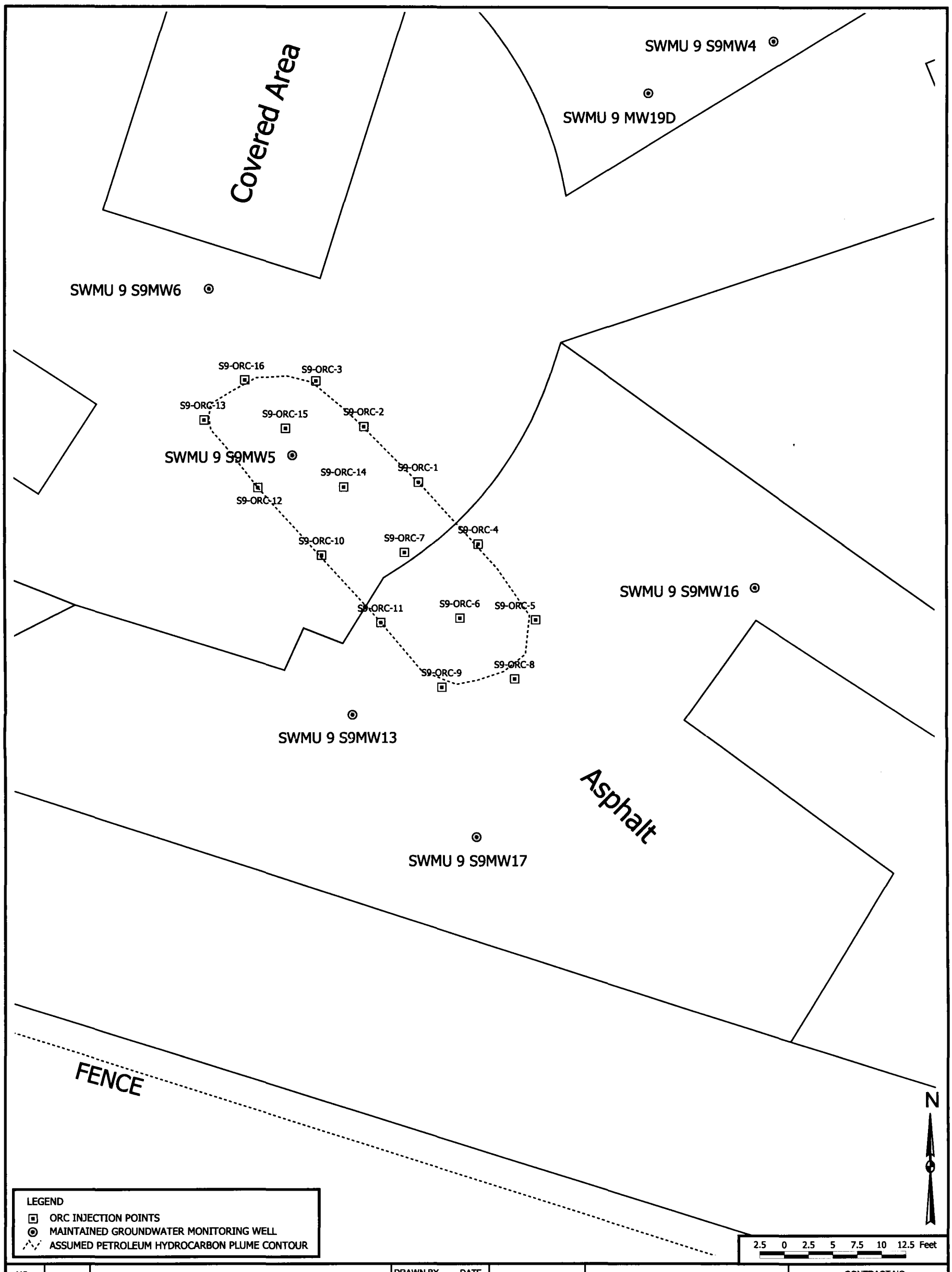

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COST/SCHED-AREA	
SCALE AS NOTED	

SWMU 9 TREATABILITY STUDY
INSTALLATION REPORT
FIGURE 2-1
ORC INJECTION POINTS
NAVAL AIR STATION
KEY WEST, FLORIDA

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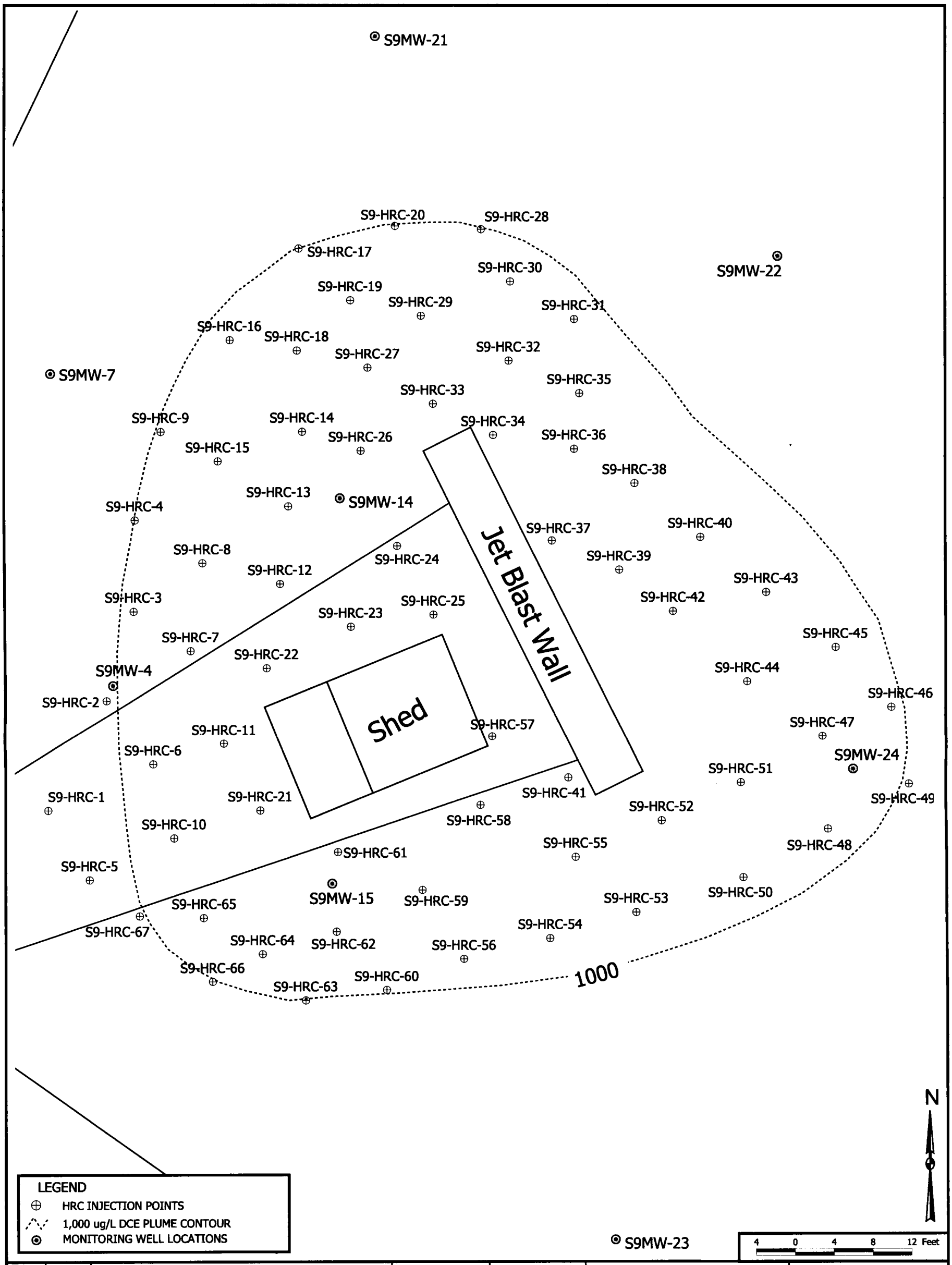

NO.	DATE	REVISIONS

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COST/SCHED-AREA	
SCALE	AS NOTED

SWMU 9 TREATABILITY STUDY
INSTALLATION REPORT
FIGURE 2-2
HRC INJECTION POINTS
NAVAL AIR STATION
KEY WEST, FLORIDA

CONTRACT NO. 7046	
APPROVED BY CMB	DATE 02/09/01
APPROVED BY	DATE
DRAWING NO.	REV. 0

P:/GOVERNMENT/KEYWEST/EGIS/SWMU9 TSI REPORT.APR LAYOUT: FIG 2-2
DATE: 2/5/2001 BY: CM

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BEI (Bechtel Environmental, Inc.), 1998. *Project Completion Report,* prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Oak Ridge, Tennessee.

TtNUS (Tetra Tech NUS, Inc.) 1999. *Corrective Measures Study for Solid Waste Management Unit 9 (SWMU 9) Boca Chica Jet Engine Test Cell, NAS Key West, Florida, Revision 2,* prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina.

TtNUS (Tetra Tech NUS, Inc.), 2000. *Enhanced Biodegradation Treatability Study Work Plan for SWMU 9, NAS Key West, Florida, Revision 1*, prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina.

APPENDIX A

RESPONSE TO COMMENTS

APPENDIX A. RESPONSE TO COMMENTS

No comments were received on Rev. 0.

APPENDIX B

DOCUMENTATION FOR DEVIATIONS FROM THE WORK PLAN

REGENESIS

January 5, 2001

Emily Harrison
TtNUS
900 Trail Ridge Rd.
Aiken, SC 29803
Fax: 803.642.8454

Subject: Acceleration of Bioremediation at the Key West NAS Site

Dear Ms. Harrison:

The following sections detail design and cost information for a potential site remediation approach at NAS Key West, FL. The HRC design is based on a number of assumptions that have been made concerning site conditions and the extent of the contaminant plume requiring remediation.

Use of HRC to Accelerate Bioremediation

Hydrogen Release Compound (HRC) is used to enhance in situ biodegradation rates for chlorinated hydrocarbons (CHs) by supporting anaerobic reductive dechlorination processes. Reductive dechlorination is now recognized as one of the primary attenuation mechanisms by which chlorinated solvent groundwater plumes can be contained and/or remediated.

HRC is a proprietary polylactate ester that, upon being deposited into the subsurface, slowly releases lactate. Lactate is metabolized by naturally occurring microorganisms, resulting in the creation of anaerobic aquifer conditions and the production of hydrogen. Naturally occurring microorganisms capable of reductive dechlorination then use the hydrogen to progressively remove chlorine atoms from chlorinated hydrocarbon contaminants (i.e. convert tetrachloroethene [PCE] to trichloroethene [TCE] to dichloroethene [DCE] to vinyl chloride [VC] to ethene).

HRC is manufactured as a viscous gel that can be injected into the saturated zone in a grid or barrier configurations for either localized area or cutoff-based treatment approaches. The use of HRC for groundwater remediation offers a comparatively simple and cost effective remediation alternative for sites that would otherwise require unacceptably long periods of time for natural attenuation or the high levels of capital investment and operating expense associated with active remediation technologies.

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rick@regenesis.com • www.regenesis.com

Design/Proposal Assumptions

Using the information you provided, we have made the following assumptions to estimate system design variables and dose amounts.

- Plume area requiring treatment: 84 ft x 80 ft
- Representative contaminant concentration: 12.8 mg/L
- Contaminated saturated zone thickness requiring treatment: 10 ft (2 to 12 ft bgs).
- Estimated groundwater velocity: up to 9 ft/year. Note that groundwater velocity controls the extent to which new contaminant is brought into the treatment zone. This contaminant loading must be considered when specifying time-release compound dosing requirements.
- Current groundwater geochemistry: generally with oxygen <2 mg/L, nitrate <1 mg/L, ferrous iron <10 mg/L, potential manganese reduction demand <5 mg/L, and potential sulfate reduction demand <100 mg/L. Higher competing electron acceptor-based electron donor demand may require increased amounts of HRC to achieve remedial goals.

The design specifications and costs provided below represent a preliminary design for an accelerated bioremediation project. This design may need to be adjusted as detailed design and regulatory oversight issues are finalized. For instance, the following design variables may need to be adjusted prior to the implementation:

- Treatment areas may need to be increased or decreased depending on the overall site remediation strategy.
- Exact HRC delivery locations should be selected in the final design process. HRC injection locations may need to be adjusted to take into account site features such as underground utilities and other site structures.

Preliminary Design and Cost Information for Full Scale Remediation

It is assumed that the full-scale remediation approach for the site would consist of a grid-based application to reduce contaminant levels in the source area.

HRC Grid Treatment	
Design Feature	**Specification**
Saturated thickness requiring treatment	10 feet
Treatment Area	80 feet x 84 feet
Delivery Pt. Spacing and Configuration	10 ft-on-center bet. rows, 10 ft-on-center within rows 8 rows of 8 points; 64 total points
HRC dose rate in lbs/vertical foot of injection	6 lbs/foot, (60 lbs/point)
Material requirement	64 pts. x 10 feet x 6 lbs/ft = 3,840 lbs
Material cost at $6/lb	$23,040 plus shipping and applicable sales tax

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Total Project Cost

The total cost of an accelerated bioremediation project can be estimated as the sum of the following items:

- HRC material and shipping costs.
- HRC injection fieldwork costs. Customers are responsible for selecting a local injection subcontractor.
- Groundwater monitoring well construction (if necessary to monitor project performance).
- Periodic groundwater sampling and analysis.
- Consultant oversight and reporting. Regenesis data evaluation and technical support are provided free of charge.

The costs provided in this letter apply to HRC material costs for one application. The need for re-applications will depend on your plume management strategy, site-specific biodegradation performance, remedial goals for the site, and other technical or regulatory considerations. For plume area treatments, one to two re-applications could be necessary over the course of the project, although each re-application would most likely be done over a reduced area and dose amount compared to the initial application. For barrier-based designs, re-applications will be necessary every one to two years as long as there is a need to prevent contaminant migration.

HRC Delivery to Contaminated Zone

Typically, HRC is applied using direct push hydraulic equipment. Drive rods are pushed to the bottom of the contaminated saturated zone and then HRC is injected as the rods are withdrawn. The minimum recommended rod size is a 0.625-inch inner diameter. For sites where direct push is not feasible, auger-based equipment can be used to deliver HRC. Also, the use of permanent, small diameter re-injection wells may be a more cost-effective approach for sites requiring repeated applications of HRC. Technical support personnel at Regenesis are available to discuss the suitability of alternate HRC delivery methods.

Costs for HRC injection should be obtained from local subcontractors. If necessary, Regenesis can assist in locating qualified HRC injection subcontractors. Budgetary cost estimates for direct push-based injection range from $1,000 to $2,000 per day. Typically, one to two HRC injection points can be completed per hour and up to 20 points can be completed per day, depending on soil type, depths of injection, and subcontractor experience.

HRC should be injected using an appropriate pump capable of processing a material with a viscosity of 20,000 centipoise at flow rates of 3 to 10 gallons per minute at pressures ranging from 200 psig to 1,500 psig. Failure to use appropriate equipment could increase field time and result in improper application of the HRC.

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Recommended Groundwater Monitoring Program for Pilot/Full Scale Treatment

Monitoring of selected wells should be conducted to validate the HRC-based enhancement of reductive dechlorination processes. Also, an initial or "baseline" round of sampling should be performed to identify pre-HRC installation groundwater conditions. After delivery of the HRC to the subsurface, samples can be collected on a monthly or bi-monthly frequency. After the initial biodegradation and geochemical trends have been identified, the monitoring frequency can be decreased to a quarterly, semiannual, or annual program.

The monitoring program should employ low flow groundwater sampling techniques and include the measurement of the following field/chemical parameters:

- All relevant contaminants
- Field parameters: dissolved oxygen, ORP, pH, temperature, and ferrous iron (optional field measurement)
- Natural attenuation/inorganic parameters: total and dissolved iron, total and dissolved manganese, nitrate, sulfate, sulfide, and chloride
- HRC-based electron donor: total organic carbon and metabolic acids (lactic, pyruvic, acetic, propionic, and butyric)
- End-product dissolved gases: carbon dioxide, methane, ethane and ethene

A specially qualified laboratory should do the analytical testing for the metabolic acids, otherwise most laboratories can provide testing for the remaining parameters. A typical cost for the above testing program is approximately $300 per sample.

Regenesis appreciates the opportunity to provide this information for your project. Please feel free to contact me with any questions or comments.

Sincerely,

Rick Gillespie
Regional Manager

C:\My Documents\Regenesis\Proposals\HRC\SC\TtNUS\e_harrison\hrc-key west NAS_1301.doc

TETRA TECH NUS
FIELD TASK MODIFICATION REQUEST FORM

NAS Key West - SWMU 9
Project/Installation Name

CTO 0007 N7046
CTO & Project Number

Mod 12
Task Mod. Number

SWMU 9 Treatability Study WP
Modification To (e.g. Work Plan)

SWMU 9
Site/Sample Location

01/20/01
Date

Activity Description: ORC/HRC Injection

Reason for Change: The amount of HRC recommended in the Treatability Study Work plan was overestimated. During the period between workplan delivery and the field event, Regenesis was consulted. Regenesis recommended decreasing the amount of HRC significantly.

Recommended Disposition: Regenesis recommended using a total of 3040 lbs of HRC and injecting into 64 holes @ 60 lbs/ft.

Field Operations Leader (Signature)

01/26/01
Date

Approved Disposition:
Approved.

Project/Task Order Manager (Signature)

2-2-01
Date

Distribution:

Program/Project File –
Project/Task Order Manager –
Field Operations Leader –

Other:

APPENDIX C

DAILY ACTIVITY LOGS

ZEBRA

DAILY PROJECT REPORT

Page 1 of 1
Project Day & Date TUES - 1-16-01

ZEBRA Office TAMPA Crew Base TAMPA Z# _____ ZEBRA Unit #17

CLIENT/OFFICE TETRA TECH - AIKEN S.C. Client Project # _____
PROJECT NAME NAVEL AIR STATION KEY WEST FL
PROJECT LOCATION BOCA CHINA FL
Client PM: RICHARD MARTY RAY Client Site Contact: EMILY HARRISON

PROJECT PERSONNEL ON SITE:

Name/Company	Start	Arrive	Leave	Finish	TPH	TH	OT
MARTY RAY - TETRA TECH							
EMILY HARRISON - TETRA TECH							
RICK VINING - ZEBRA	700	730	5.30				
BRAD CARLSON - ZEBRA	700	730	5.30				

Description of Work (detailed):

Completed 24 Concrete and Asphalt Borings To Prepare For HRC and ORC injections

Materials Used	Qty./Units	Additional Equipment On Site	Qty./Units

Probe Tools Damaged/Lost:

Number of Points	Number of Samples	Soil MC	Soil LB	GW	Wells Installed	Soil Gas	Sparge Points	Misc.

Field Verification:

ZEBRA: R. Vining CLIENT: Marty Ray 1/17/01

ZEBRA

DAILY PROJECT REPORT

Page 1 of 1

Project Day & Date WED 1-17-01

ZEBRA Office TAMPA Crew Base TAMPA Z# _____ ZEBRA Unit #17

CLIENT/OFFICE TETRA TECH - AIKEN S.C. Client Project # _____
PROJECT NAME NAVEL AIR STATION
PROJECT LOCATION KEY WEST FL
Client PM: MARTY RAY Client Site Contact: EMILY HARRISON

PROJECT PERSONNEL ON SITE:

Name/Company	Start	Arrive	Leave	Finish	TPH	TH	OT
MARTY RAY - TETRA TECH							
EMILY HARRISON - TETRA TECH							
RICK VINING - ZEBRA	7	7 30	7				
BRAD CARLSON - ZEBRA	7	7 30	7				

Description of Work (detailed):

Completed 11 ORC injections To Max Depth of 12' BG

Materials Used	Qty./Units	Additional Equipment On Site	Qty./Units

Probe Tools Damaged/Lost:

Number of Points	Number of Samples	Soil MC	Soil LB	GW	Wells Installed	Soil Gas	Sparge Points	Misc.

Field Verification:

ZEBRA: R. Vining CLIENT: M. Ray

ZEBRA

DAILY PROJECT REPORT

Page 1 of 1

Project Day & Date THURS 1/18/01

ZEBRA Office TAMPA Crew Base 7995 Z# 3517 ZEBRA Unit #17

CLIENT/OFFICE TETRA TECH - AIKEN S C Client Project #
PROJECT NAME KEY WEST NAVE AIR STATIONS
PROJECT LOCATION KEY WEST, FL
Client PM: MARTY RAY Client Site Contact: EMILY HARRISON

PROJECT PERSONNEL ON SITE:

Name/Company	Start	Arrive	Leave	Finish	TPH	TH	OT
MARTY RAY / TETRA TECH							
RICK VINANNO / ZEBRA	6:30	7:00	7:00				
BRAD CARLSON / ZEBRA	6:30	7:00	7:00				

Description of Work (detailed):

COMPLETED 6 ORC INJECTIONS 12' BG
COMPLETED 4 CONCRETE CORE PILOT HOLES
COMPLETED 3 HRC INJECTIONS 12' BG

Materials Used	Qty./Units	Additional Equipment On Site	Qty./Units

Probe Tools Damaged/Lost:

Number of Points	Number of Samples	Soil MC	Soil LB	GW	Wells Installed	Soil Gas	Sparge Points	Misc.
								3/HRC 6/ORC

Field Verification:

ZEBRA: [signature] CLIENT: [signature] 1/19/01

ZEBRA

DAILY PROJECT REPORT

Page 1 of 1

Project Day & Date FRI 1-19-01

ZEBRA Office TAMPA Crew Base 3117 Z# 3517 ZEBRA Unit 17

CLIENT/OFFICE TETRA TECH - AIKEN S.C. Client Project #
PROJECT NAME NAVAL AIR STATION
PROJECT LOCATION KEY WEST FL
Client PM: EMILY HARRISON Client Site Contact:

PROJECT PERSONNEL ON SITE:

Name/Company	Start	Arrive	Leave	Finish	TPH	TH	OT
EMILY HARRISON - TETRA TECH							
MARTY RAY - TETRA TECH							
RICK VINING - ZEBRA	7	7:15	7				
BRAD CARLSON - ZEBRA	7	7:15	7				

Description of Work (detailed):

Completed 11 HRC injection to max depth of 12' BG

Materials Used	Qty./Units	Additional Equipment On Site	Qty./Units

Probe Tools Damaged/Lost:

Number of Points	Number of Samples	Soil MC	Soil LB	GW	Wells Installed	Soil Gas	Sparge Points	Misc.

Field Verification:

ZEBRA: R Vining CLIENT: E Harrison

ZEBRA

DAILY PROJECT REPORT

Page 1 of 1

Project Day & Date 1/21/01

ZEBRA Office TAMPA Crew Base 7995 Z# 3517 ZEBRA Unit #17 TRUCK

CLIENT/OFFICE TETRA TECH - S C Client Project # SWMU 9
PROJECT NAME KEY WEST NAVEL AIR STATION
PROJECT LOCATION KEY WEST, FL
Client PM: EMILY HARRISON Client Site Contact: EMILY HARRISON

PROJECT PERSONNEL ON SITE:

Name/Company	Start	Arrive	Leave	Finish	TPH	TH	OT
EMILY HARRISON / TETRA TECH							
RICK VINING / ZEBRA							
BRAD CARLSON / ZEBRA							

Description of Work (detailed):

COMPLETED 15 HRC INJECTIONS

HAD REFUSAL AT 2 POINTS / RETRIED AT 5 ADDITIONAL LOCATIONS (4 AND 1)

Materials Used	Qty./Units	Additional Equipment On Site	Qty./Units

Probe Tools Damaged/Lost:

Number of Points	Number of Samples	Soil MC	Soil LB	GW	Wells Installed	Soil Gas	Sparge Points	Misc.
								5 REFUSAL 15 HRC

Field Verification:

ZEBRA: CLIENT:

ZEBRA

DAILY PROJECT REPORT

Page 1 of 1

Project Day & Date 1/23/01 (TUES)

ZEBRA Office TAMPA Crew Base 7995 Z# 3517 ZEBRA Unit #17 TRUCK

CLIENT/OFFICE TETRA TECH / SC Client Project #

PROJECT NAME NAVEL AIR STATION

PROJECT LOCATION KEY WEST

Client PM: EMILY HARRISON Client Site Contact: EMILY HARRISON

PROJECT PERSONNEL ON SITE:

Name/Company	Start	Arrive	Leave	Finish	TPH	TH	OT
EMILY HARRISON / TETRA TECH							
RICK VINING / ZEBRA		7 AM	7 PM				
BRAD CARSON / ZEBRA		7 AM	7 PM				

Description of Work (detailed):

COMPLETED 22 HRC INJECTIONS 12 FT (BG)

Materials Used	Qty./Units	Additional Equipment On Site	Qty./Units

Probe Tools Damaged/Lost:

Number of Points	Number of Samples	Soil MC	Soil LB	GW	Wells Installed	Soil Gas	Sparge Points	Misc.
								22 HRC

Field Verification:

ZEBRA: [signature] CLIENT: [signature]

ZEBRA

DAILY PROJECT REPORT

Page 1 of 1

Project Day & Date WED 1-24-01

ZEBRA Office TAMPA Crew Base 7995 Z# 7517 ZEBRA Unit 17

CLIENT/OFFICE TETRA TECH – AIKEN Client Project #

PROJECT NAME NAVEL AIR STATION

PROJECT LOCATION KEY WEST FL

Client PM: EMILY HARRISON Client Site Contact:

PROJECT PERSONNEL ON SITE:

Name/Company	Start	Arrive	Leave	Finish	TPH	TH	OT
EMILY HARRISON – TETRATECH							
RICK VINING – ZEBRA							
BRAD CARLSON – ZEBRA							

Description of Work (detailed):

Completed 17 HRC injections to max Depth of 12 ft

Materials Used	Qty./Units	Additional Equipment On Site	Qty./Units

Probe Tools Damaged/Lost:

Number of Points	Number of Samples	Soil MC	Soil LB	GW	Wells Installed	Soil Gas	Sparge Points	Misc.

Field Verification:

ZEBRA: CLIENT: E. J. Harrison