Well Abandonment and Biosparge System Removal Work Plan

SWMU (Solid Waste Management Unit) 26, Former 724th Tanker Purging Station
EPA ID # GA9 210 020 872 (HQAES SITE ID 13305.1072)

ENVIRONMENTAL REMEDIATION SERVICES
FORT STEWART, GEORGIA

July 2023

Prepared for:

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Contract No.: W9124J-18-D-0004
Delivery Order W9124J-20-F-0049

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Fort Stewart
SWMU 26 Well Abandonment and Biosparge System Removal Work Plan
SMWU 26, Former 724th Tanker Purging Station
Fort Stewart, Georgia; EPA ID # GA9 210 020 872 (HQAES Site ID: 13305.1072)
Environmental Remediation Services
Contract Number: W9124J-18-D-0004 / W9124J-19-F-0049

3 Jul 2023

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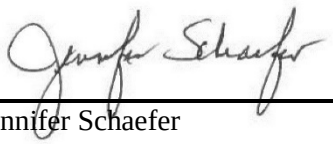

3 Jul 2023

Jennifer Schaefer — Date
Project Manager

GEORGIA REGISTERED PROFESSIONAL ENGINEERING CERTIFICATION

I certify that I am a qualified professional engineer (P.E.) who has received a baccalaureate or post-graduate degree in engineering and have sufficient training and experience in environmental engineering and related fields, as demonstrated by state registration and completion of accredited university courses, to enable me to make sound professional judgments regarding groundwater monitoring and contaminant fate and transport. I further certify that this report was prepared by myself or by a subordinate working under my direction.

Name: C. Scott Bostian, P.E.

License Number: 026133

Expiration Date: December 31, 2024

C. Scott Bostian, P.E. — 8/4/2023 Date

GEORGIA REGISTERED PE026133 PROFESSIONAL ENGINEER CURTIS SCOTT BOSTIAN

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ACRONYMS AND ABBREVIATIONS

ECC	Environmental Chemical Corporation
Fort Stewart	Fort Stewart Military Reservation
GAEPD	Georgia Environmental Protection Division
P.E.	Professional Engineer
SWMU	solid waste management unit

1.0 INTRODUCTION

Environmental Chemical Corporation (ECC) has been retained by the United States Army Environmental Command to perform environmental activities at Fort Stewart Military Reservation (Fort Stewart) in accordance with the requirements of the Environmental Remediation Multiple Award Contract No. W9124J-18-D-0004, Delivery Order No. W9124J-20-F-0049.

This Work Plan describes proposed well abandonment and biosparge system removal activities as part of site closure for Solid Waste Management Unit (SWMU) 26. The objective is described in **Section 2.0** of this Work Plan and the proposed well abandonment procedures are discussed in **Section 3.0**. Biosparge system removal activities are discussed in **Section 4.0**. Georgia Environmental Protection Division (GAEPD) approved No Further Action status for SWMU 26 (Former 724th Tanker Purging Station) (GAEPD 2023) in a letter dated 2 February 2023.

Fort Stewart is located in portions of Liberty, Bryan, Long, Tattnall, and Evans Counties, Georgia, approximately 40 miles west-southwest of Savannah, Georgia. The cantonment, also known as the garrison area, is located within the Liberty County portion on the southern boundary of the reservation. Hinesville, Georgia, is the nearest city to the garrison area and is located immediately outside of the reservation boundary. **Figure 1** shows the location of Fort Stewart and the Former 724th Tanker Purging Station, SWMU 26.

2.0 OBECTIVE

The objective of this Work Plan scope is the removal of all equipment, piping, and material associated with the monitoring well network and biosparge system, and restoration of the site to original conditions for future use by the Army. All wells will be abandoned in accordance with Georgia regulations and all equipment and materials will be removed and disposed of and/or relocated in accordance with Army regulations and/or directives.

3.0 WELL ABANDONMENT PROCEDURES

The ECC team will coordinate with Fort Stewart personnel prior to mobilizing subcontractors, materials, and ECC team personnel to the site. Each well (monitoring and biosparge) will be plugged and abandoned by a licensed driller in accordance with The Georgia Water Well Standards Act (12-5-120 thru 138) of the Official Code of Georgia Annotated and procedures developed by the GAEPD (GAEPD 2022). All field activities will be conducted under the supervision of the onsite ECC team Geologist.

The well abandonment scope for SWMU 26 includes the proper abandonment of 56 monitoring wells and 17 biosparge wells. **Figure 2** shows the locations of the monitoring and biosparge wells. **Table 1** lists construction details for the 34 shallow monitoring wells and 22 deep monitoring wells proposed for abandonment at SWMU 26. **Table 2** lists construction details for the 17 biosparge wells proposed for abandonment at SWMU 26. All wells are in grass or dirt covered areas.

The wells will be properly abandoned by plugging the well using bentonite or cement grout using a grout pipe. Each casing will be excavated and cut off at a depth of 2 feet below ground surface. The excavated area will then be backfilled with native material. The surface completions (well pads, manholes, stick-ups) will be removed and transported off site for proper disposal. Digging clearances will be obtained through Georgia 811 prior to excavating around each well casing. Prior to biosparge well abandonment activities, system piping will be disconnected from biosparge system wells. Biosparge system piping will be removed and disposed of as described in **Section 4.0** below. All well locations will be restored by backfilling as necessary and grading to match surrounding site conditions. Grass seed will be applied to all disturbed areas where applicable.

Photographs will be taken of each well before and after abandonment with the well identification number included in each photograph. Records of abandonment procedures will be kept for each abandoned well and will include the depth of each layer of sealing and fill material, the quantity of sealing materials used, and measurements of static water levels and depths. These records will be submitted in the subsequent Well Abandonment and Biosparge System Removal Report.

Waste generated during the well abandonment activities are anticipated to consist of casing material, manholes, stick-ups, concrete, personal protective equipment, and disposable materials/general refuse (e.g., nitrile gloves, paper, plastic). Waste generated will be transported and disposed of as non-hazardous waste in accordance with Army regulations and/or directives.

4.0 BIOSPARGE SYSTEM REMOVAL

The ECC team will coordinate with Fort Stewart personnel prior to mobilizing subcontractors, equipment, and ECC team personnel to the site. Equipment and components comprising the biosparge system are listed in **Table 3**. Photographs of the biosparge system installation activities in 2011 are included in **Appendix A**. Photographs of the biosparge system equipment and components are included in **Appendix B**. The biosparge system and piping layouts, and the typical trench construction and biosparge well vault construction configurations, are shown on Figures C-1 and C-2 respectively in **Appendix C**.

4.1 Aboveground Piping

Aboveground piping from the system trailer will be removed and taken to a storage location designated by Fort Stewart to be re-used or disposed of in accordance with Army regulations and/or directives.

4.2 Underground Piping

Underground piping will be removed by exposing the piping through machine excavation. Underground piping will be taken to a storage location designated by Fort Stewart to be disposed of off installation in accordance with Army regulations and/or directives. Gravel placed at the base of the trench during construction will be left in-place. Any soil gas monitoring points that can be located will be removed and disposed of off installation in accordance with Army regulations and/or directives.

4.3 Equipment and Ancillary Component

Equipment and ancillary components consist of the compressor and associated equipment (gauges, alarms, etc.) within the building. Equipment removal will involve the power supply to the compressor being disconnected and removed by a licensed electrician. Once the power supply is removed, the compressor will be disconnected from the piping, and the filter and the silencer will be removed. The inlets and outlets of the compressor will be capped to prevent moisture and debris from accumulating in the compressor system. The valves, switches, gauges, and alarms connected to the run of piping in the building will be disconnected. The above equipment and ancillary components will be taken to a storage location designated by Fort Stewart to be re-used or disposed of in accordance with Army regulations and/or directives.

4.4 Building and Fence Removal

The building is approximately 6 feet by 10 feet in area and includes a ventilation system attached to the building. After power is disconnected, ventilation components will be disassembled from the building. The building will then be taken intact (not disassembled) to the Fort Stewart Recycling Processing Center for reuse or recycling. Chain link fence surrounding the building (approximately 64 linear feet and 4 feet high) will be removed and taken to the Fort Stewart Recycling Processing Center to be recycled.

4.5 Concrete Pad Removal

After the building and fence are removed, the concrete pad and steel straps will be removed and disposed of in accordance with Army regulations and/or directives. Gravel under and around the concrete pad will be left in place.

4.6 Site Restoration

Site restoration activities will include removal of all debris, as well as backfilling and bringing all excavation areas to existing grade. Disturbed areas will be seeded with grass and restored to conditions matching their surroundings. The portions of the dirt/gravel road impacted by underground pipe removal will be restored to original condition.

4.7 Power Pole and Electrical Service Equipment

Electrical power service to the system has already been deactivated. Fort Stewart Public Works or a designated power company will be contacted regarding disconnecting power lines and removing the transformer, telephone pole, and associated components in accordance with Army regulators and/or directives. After electrical components have been disconnected, system components will be taken to a storage location designated by Fort Stewart for reuse, recycling, or disposal in accordance with Army regulations and/or directives.

Electrical wire connecting the system disconnect switches to the former site power source will be removed. All electrical wiring will be recycled at the Fort Stewart Recycling Processing Center.

Buried PVC electrical conduit located between the equipment building and the former site power source will also be removed. PVC conduit will be disposed of off installation in accordance with Army regulations and/or directives.

5.0 DELIVERABLES

A Well Abandonment and Biosparge System Removal Report will be submitted after the work presented in this Work Plan is completed and submitted to the Army and GAEPD for review and approval. The abandonment documentation, including photographic documentation of the abandonment activities for each well, documentation of disposition of biosparge system components, and documentation of site restoration will be included in the report.

6.0 SCHEDULE

The field activities will be scheduled upon approval of this Work Plan by GAEPD. A summary of the proposed tasks listed in the anticipated order of implementation is below:

- Biosparge and monitoring well abandonment
- Underground and aboveground pipe removal
- Equipment and ancillary component removal
- Building and fence removal
- Concrete pad removal
- Power pole removal
- Site restoration

7.0 REFERENCES

GAEPD. 2022 (Current through the 2022 Regular Session of the Georgia General Assembly). *Rules for Safe Drinking Water, Official Compilation of the Rules and Regulations for the State of Georgia § 12-5-53, Georgia Department of Natural Resources, Environmental Protection, Subject 391-3-5.*

GAEPD. 2023. *Letter from Kim Hembree (GAEPD) to James L. Heidle (Fort Stewart, Georgia), RE: Request for No Further Action Status and Site Closure for Solid Waste Management Unit 26, Former 724th Tanker Purging Station, Fort Stewart, Georgia; dated June 08, 2022 and received June 15, 2022; EPA ID GA9210020872*. February.

TABLES

Table 1. Shallow and Deep Monitoring Well Construction Details

SWMU 26 (Former 724th Tanker Purging Station)

Well ID	Well Diameter (inches)	Total Depth (ft bls)	Aquifer Zone	Date Installed
MW-01	2	14.5	Shallow	7/23/1997
MW-03	2	14.5	Shallow	7/24/1997
MW-05	2	15	Shallow	7/25/1997
MW-06R	2	13.5	Shallow	3/29/2011
MW-07	2	17	Shallow	1/13/2000
MW-09	2	19	Shallow	1/12/2000
MW-10	2	44	Deep	1/12/2000
MW-11	2	18.6	Shallow	3/30/2000
MW-12	2	15	Shallow	3/29/2000
MW-13	2	15	Shallow	3/29/2000
MW-14	2	15	Shallow	3/29/2000
MW-15R	2	13.5	Shallow	3/29/2011
MW-16	2	17	Shallow	7/21/2000
MW-17	2	17	Shallow	7/20/2000
MW-18	2	16	Shallow	7/20/2000
MW-19	2	17	Shallow	7/20/2000
MW-20	2	17	Shallow	7/21/2000
MW-21	2	16.5	Shallow	7/20/2000
MW-22	2	15	Shallow	7/21/2000
MW-23	2	29	Deep	7/21/2000
MW-24R	2	13.5	Shallow	3/30/2011
MW-25R	2	13.5	Shallow	3/30/2011
MW-26	2	13.9	Shallow	3/12/2001
MW-28R	2	13.5	Shallow	3/29/2011
MW-29	2	14	Shallow	3/7/2001
MW-30	2	19	Shallow	3/8/2001
MW-31	2	14.5	Shallow	3/7/2001
MW-32	2	16	Shallow	4/6/2001
MW-33	2	14	Shallow	4/6/2001
MW-34	2	14	Shallow	4/6/2001
MW-35	2	28	Deep	12/14/2003
MW-36R	2	25.5	Deep	3/29/2011
MW-37	2	26	Deep	12/15/2003
MW-38	2	30	Deep	12/5/2003
MW-39	2	26	Deep	12/15/2003
MW-40	2	13	Shallow	12/14/2003

Table 1. Shallow and Deep Monitoring Well Construction Details

SWMU 26 (Former 724th Tanker Purging Station)

Well ID	Well Diameter (inches)	Total Depth (ft bls)	Aquifer Zone	Date Installed
MW-41	2	12.5	Shallow	12/14/2003
MW-42	2	22	Deep	6/18/2004
MW-43	2	23	Deep	6/19/2004
MW-44	2	22	Deep	6/19/2004
MW-45	2	23	Deep	6/19/2004
MW-46	2	25	Deep	6/20/2004
MW-47	2	14	Shallow	8/22/2005
MW-48	2	28.5	Deep	8/22/2005
MW-49	2	14	Shallow	8/19/2005
MW-50	2	32	Deep	8/20/2005
MW-51	2	14	Shallow	8/20/2005
MW-52	2	31	Deep	8/21/2005
MW-53	2	32	Deep	8/20/2005
MW-54	2	32	Deep	8/23/2005
MW-55	2	32	Deep	8/24/2005
MW-56	2	32	Deep	8/24/2005
MW-57	2	31.8	Deep	8/19/2005
MW-58	2	25.5	Deep	3/31/2011
MW-59	2	13.5	Shallow	3/31/2011
MW-60	2	31.5	Deep	3/31/2011

Notes:

ft bls = ft below land surface

Table 2. Biosparge Well Construction Details

SWMU 26 (Former 724th Tanker Purging Station)

Well ID	Well Diameter (inches)	Total Depth (ft bls)	Aquifer Zone	Date Installed
BSP-1	1	30.5	Deep	4/4/2011
BSP-2	1	30.5	Deep	4/4/2011
BSP-3	1	31.0	Deep	4/5/2011
BSP-4	1	31.0	Deep	4/6/2011
BSP-5	1	30.5	Deep	4/6/2011
BSP-6	1	31.5	Deep	4/6/2011
BSP-7	1	32.5	Deep	10/13/2010
BSP-8	1	30.5	Deep	4/6/2011
BSP-9	1	30.5	Deep	4/7/2011
BSP-10	1	32	Deep	4/20/2011
BSP-11	1	31	Deep	4/21/2011
BSP-12	1	31.0	Deep	4/20/2011
BSP-13	1	31.0	Deep	4/19/2011
BSP-14	1	31.0	Deep	4/19/2011
BSP-15	1	31	Deep	4/21/2011
BSP-16	1	30.5	Deep	4/4/2011
BSP-17	1	30.5	Deep	4/2/2011

Notes:

ft bls = ft below land surface

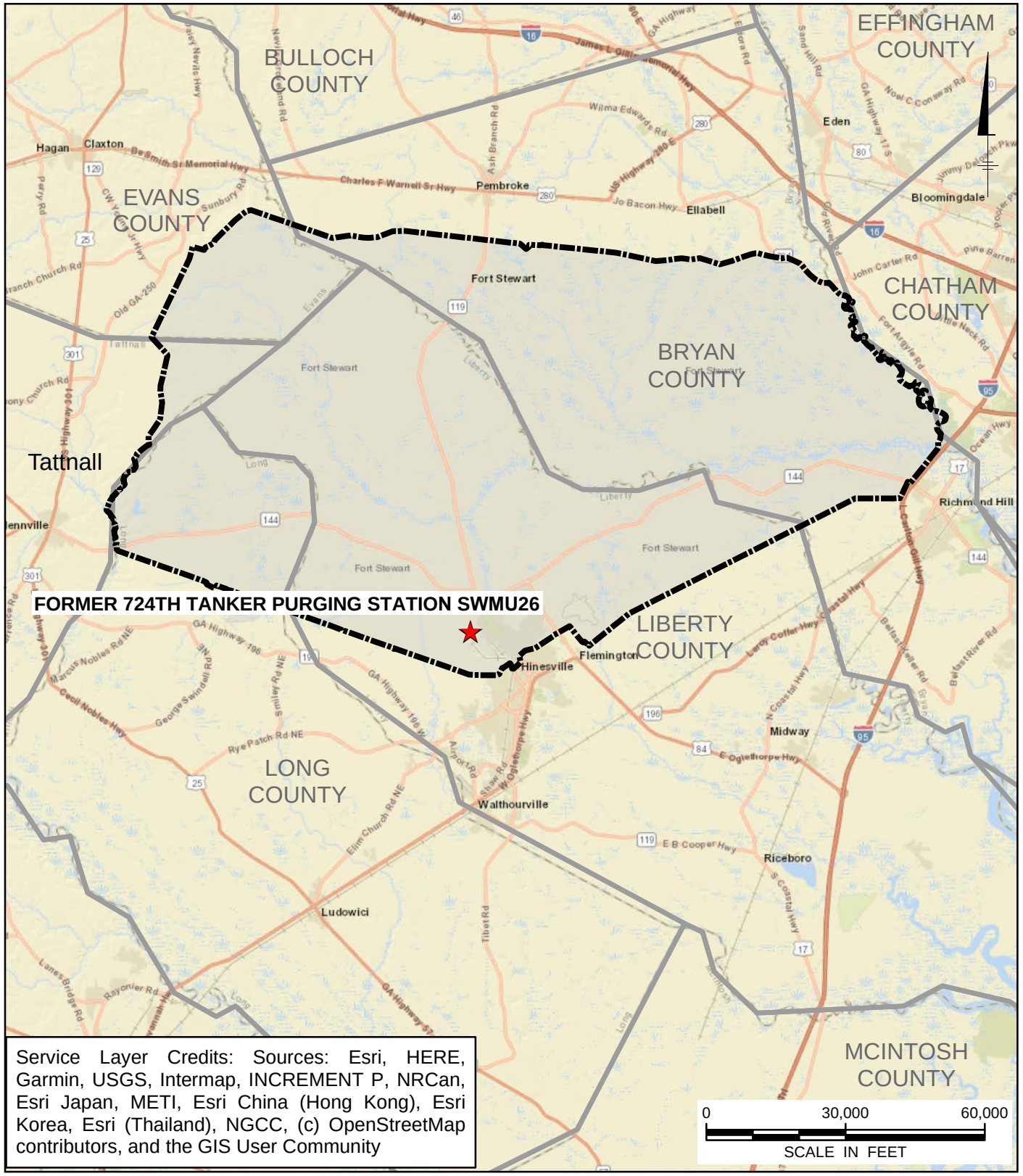
Table 3. Biosparge System Components

SWMU 26 (Former 724th Tanker Purging Station)

Equipment
Rotary Claw Compressor with 20 HP 230/460/3P Motor
Control Panel with Auto dialer
3" Galvanized Steel Pipe - 5 LF
3" HDPE Pipe - 250 LF (underground)
1" HDPE Pipe - 3,150 LF (underground)
Differential pressure alarm units
Gauges
Switch (snap switch)
Air Filter
Silencer
Two (2) globe valves
Two (2) ball valves
Building
Aluminum Building with metal floor
Control Panel Mounted to Exterior
Steel Straps (Building to Concrete)
Roadbox with finished concrete
4-ft high Chain-link Fence around building
Power Service Box
Ventilation Fan with Thermostat and Louvers

ft - Feet
HDPE - High Density Polyethylene
HP - Horsepower
LF - Linear Feet

FIGURES



FORT STEWART MILITARY RESERVATION, GEORGIA

SMWU 26

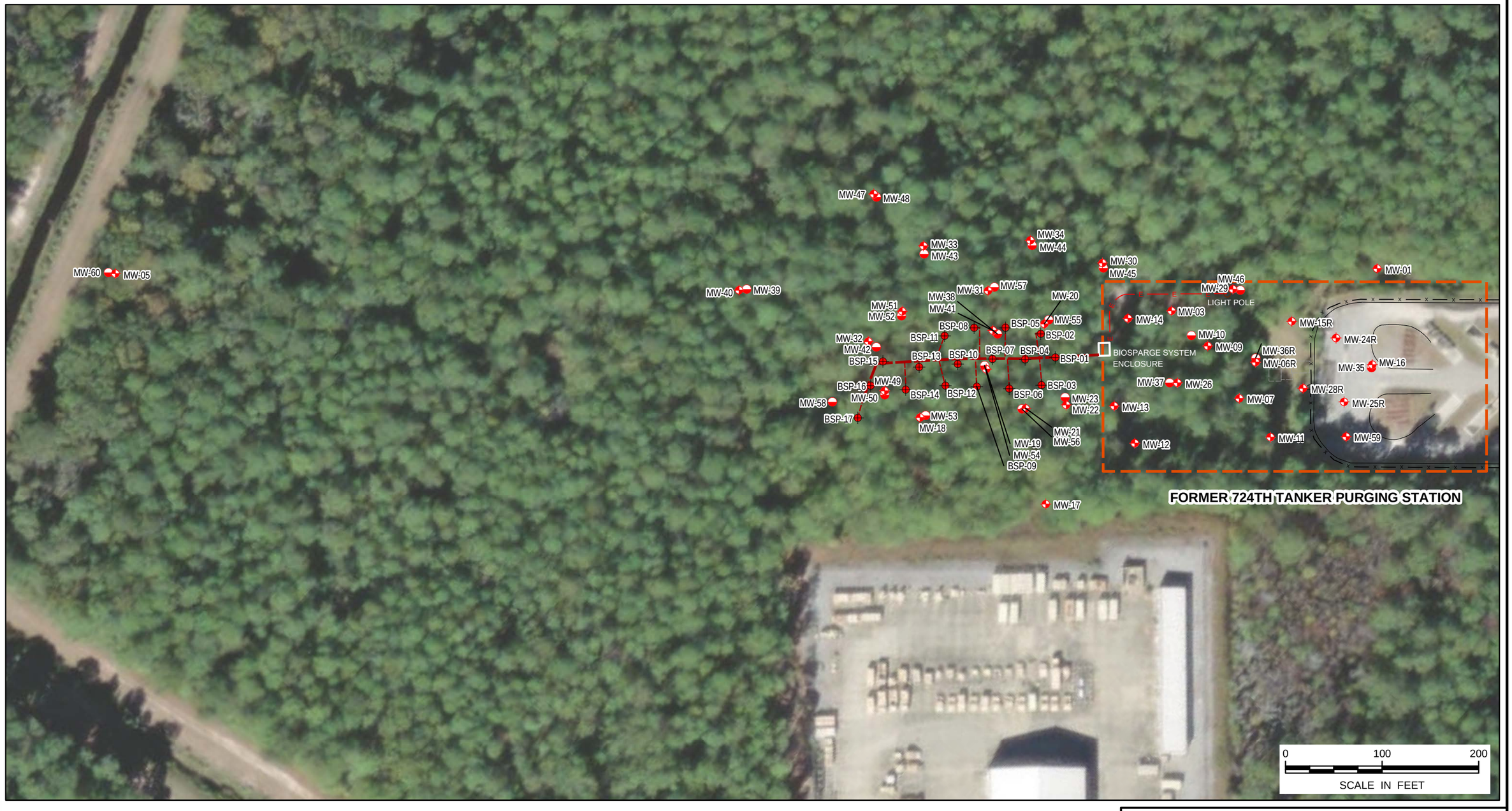
Site Location Map

ARCADIS

FIGURE

1

T:_ENV\FORT_STEWART\PIKA\MAPDOCS\WAWP\F1 SITELOCATIONMAP.MXD 1/3/2023 3:42:17 PM KSINSABAUGH



PROJECTION: NAD83 State Plane Georgia East Feet
AERIAL SOURCE: DIGITALGLOBE (2018).

LEGEND

- Monitor Well (shallow)
- Monitor Well (deep)
- Biosparge Injection Well (deep)
- Former 724th Tanker Purge Station Area
- 2" Underground Electrical Conduit
- 1" Biosparge System Piping
- 3" Biosparge System Piping

FORT STEWART MILITARY RESERVATION, GEORGIA
SWMU 26

Proposed Monitoring Well and Biosparge System Abandonment Locations

ARCADIS

FIGURE 2

CITY: FRAME DIV/GROUP: IM/DV LD: K. SINSABAUGH
PATH: T:_ENV\FORT_STEWART\PIKA\MAPDOCS\WAWPF2 S26_PROPOSEDMW-BWLOCS.MXD SAVED: 1/4/2023 BY: KSINSABAUGH

APPENDIX A

BIOSPARGE SYSTEM CONSTRUCTION PHOTOGRAPHS

Fort Stewart FST-26 Biosparge Installation

Photograph 1 – View facing east of trench for 3” CPVC running horizontal. BSP-01 visible in background to left of trench. Spur running toward right leads to BSP-03.

Photograph 2 – View facing north of BSP-02. Skid steer is being used to place initial stone basing material in trench prior to laying piping.

Photograph 3 – View to facing south of BSP-03 showing placement of stone by hand where necessary to ensure adequate dispersal.

Photograph 4 – View to east showing 3” main trunk running between MW-54 and MW-19. Piping has been placed in trench on basing stone.

Photograph 5 – View to east of connections from 3” main to 1” spurs. BSP-08 is to the left and BSP-09 is toward the right.

Photograph 6 – View facing south of spur from BSP-08 toward main trunk. Stand pipe for MW-54 visible on right of frame.

Photograph 7 – View of trench in process of being backfilled. Stone in foreground surrounds CPVC to depth of approximately 2 feet below grade. Native soil filled to approximately 6 inches below grade, utility marking tape placed and native soil to surface. Vibrator plate compactor used to compact soils.

Photograph 8 – View of caution tape used to demarcate exclusion zone.

Photograph 9 – view facing north of trench for electrical conduit. Form for concrete pad to house system is visible in lower left of frame.

Photograph 10 – View facing south of electrical trench with base stone in place.

Photograph 11 – View facing south of electrical conduit being set in stone and form for concrete pad.

Photograph 12 – view facing west of utility marking tape being placed over electrical conduit at approximate depth of six inches.

Photograph 13 – View of new power drop installed awaiting wiring. MW-46 is visible in right of frame.

Photograph 14 – View of concrete pad for system building after pour and screeding.

Photograph 15 – View of roadbox with finished concrete.

Photograph 16 – View of facing east of area around MW-54 and MW-19 after grading and placement of pine straw.

Photograph 17 – View of power drop wired and roadway repaired with stone.

APPENDIX B

COMPLETED BIOSPARGE SYSTEM AND EQUIPMENT PHOTOGRAPHS

System Building and Fencing

Air Filter

Compressor Silencer

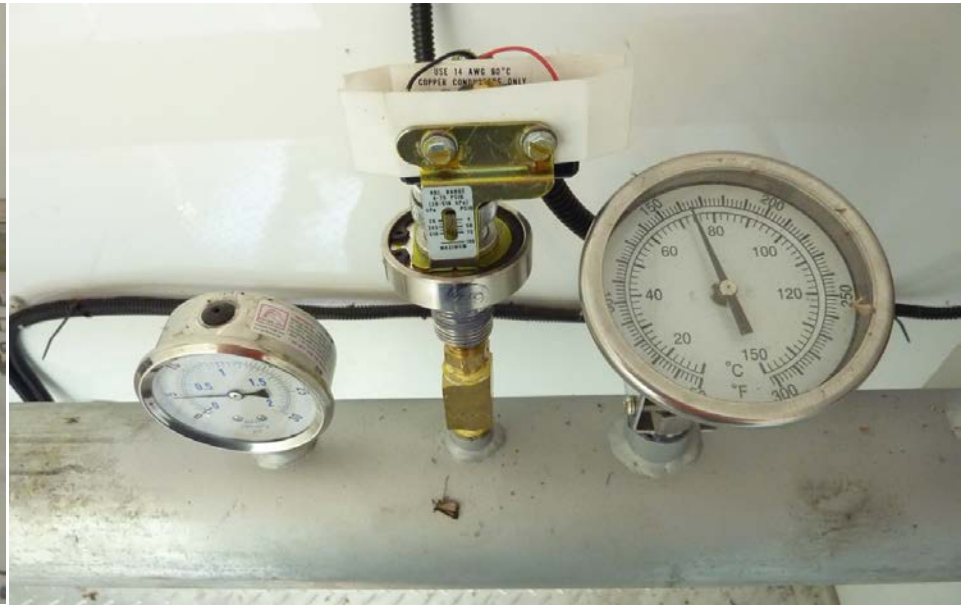
Compressor with Specifications

Control Panel and Alarms



Pressure Gauges and Differential Pressure Alarm Units Inside of Building


Building Attachment to Concrete Pad via Steel Straps



Closer View of Pressure Gauges and Differential Meter Connection



Utility Pole and Power Line.

Note: Approximate distance from utility pole to system building is 60 yards.

APPENDIX C
BIOSPARGE SYSTEM CONSTRUCTION FIGURES

MW-47
MW-48
MW-34
MW-44
MW-33
MW-43
Typical Biosparge Well Detail
A
C1 C2
MW-30
MW-45
B
C1 C2
Typical Trench Detail
MW-01
MW-05
(650 feet due west of MW-40)
MW-40
MW-39
MW-31
MW-57
MW-29
MW-46
NEAREST
LIGHT POLE
MW-51
MW-52
MW-14
MW-03
MW-15
BSP-11
BSP-8
BSP-5
MW-55
MW-20
MW-41
MW-38
BSP-2
MW-10
MW-08
MW-32
MW-42
Well Cluster-1
Well Cluster-4
MW-09
BSP-15
BSP-13
BSP-10
BSP-7
BSP-4
BSP-1
MW-36
MW-24
MW-54
MW-19
MW-27
MW-16
MW-35
SYSTEM
ENCLOSURE
MW-06
BSP-16
BSP-14
BSP-12
BSP-9
BSP-6
BSP-3
MW-37
MW-26
MW-58
MW-49
MW-50
Well Cluster-2
Well Cluster-3
MW-23
MW-22
MW-07
MW-28
MW-25
MW-13
MW-56
MW-21
BSP-17
MW-18
MW-53
B
C1 C2
Typical Trench Detail
B
C1 C2
Typical Trench Detail
MW-11
MW-12
MW-17
0
50
100
SCALE IN FEET

LEGEND

- Monitor Well (shallow)
- Monitor Well (deep)
- Monitor Well Cluster
- Pilot Test Injection Well
- Proposed Biosparge Injection Well
- E — 2" Underground Electrical Conduit
- 1" Biosparge System Piping
- 3" Biosparge System Piping

REFERENCE: SAIC (2008).

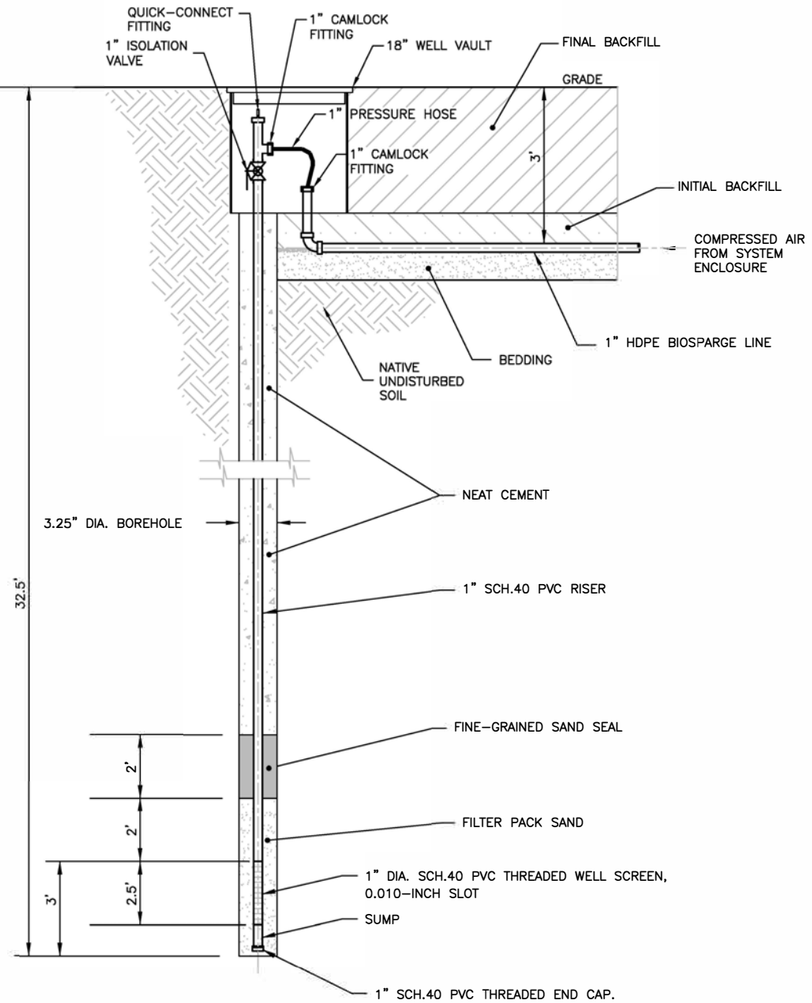
FORT STEWART MILITARY RESERVATION, GEORGIA
SWMU 26 – FORMER 724TH TANKER PURGE STATION IN-SITU BIOSPARGE SYSTEM

Biosparge System Layout

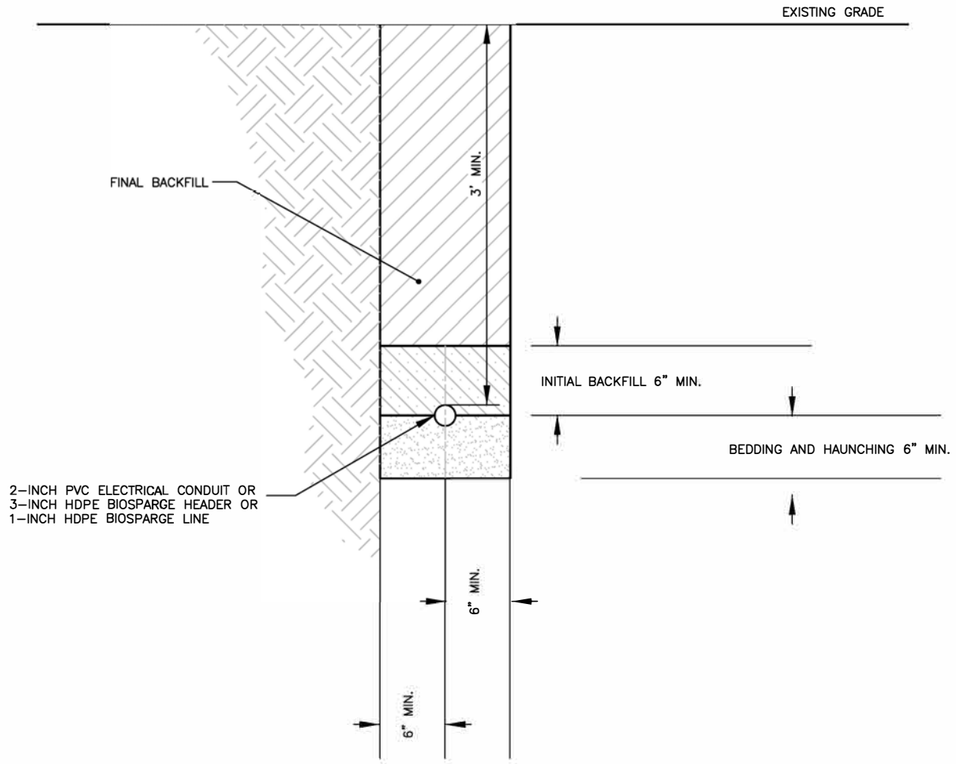
ARCADIS

FIGURE
C-1

CITY:(KNOXVILLE) DIV/GROUP:(ENV) DB:(B.ALTOM) LD:(B.ALTOM) PIC:(T.TALELE) PM:(C.BERTZ) APM:(S.GIBBONS) TM:(A.AUFFERMANN)
PROJECT: GP08HAFS.F26C.GHBPS PATH: G:\GIS\Ft Stewart\MapDocs\F26\2011 BIOSPARGE\C-1 S26_BIO SYS layout rev201104.mxd - 4/20/2011 @ 2:24:50 PM



A C1 C2 TYPICAL BIOSPARGE WELL DETAIL
NOT TO SCALE



B C1 C2 TYPICAL TRENCH DETAIL
NOT TO SCALE

GENERAL CONSTRUCTION NOTES:

1. BIOSPARGE WELLS TO BE INSTALLED BY OTHERS.
2. ALL PIPING TO BIOSPARGE WELLS TO BE ASSEMBLED PER SYSTEM LAYOUT DRAWING C1.
3. ALL VALVES AND GAUGES TO BE PLACED IN LOCATIONS THAT ALLOW FOR EASY VIEWING AND ACCESS.
4. FINAL CENTERLINE COORDINATES OF BIOSPARGE WELLS TO BE SURVEYED AND RECORDED FOR USE IN THE PREPARATION OF AS–BUILT DRAWINGS.
5. BEDDING AND HAUNCHING MATERIAL TO BE CLEAN, COARSE AGGRAGATE GRADUATION NO. 57 OR EQUIVALENT.

FORT STEWART MILITARY RESERVATION, GEORGIA
SWMU 26 – FORMER 724TH TANKER PURGE STATION IN-SITU BIOSPARGE SYSTEM

Typical Biosparge Well and Trench Details

ARCADIS

FIGURE
C-2