ADDITIONAL SITE CHARACTERIZATION WORK SCOPE
HOFF VC SITE
NEW HANOVER TOWNSHIP, MONTGOMERY COUNTY, PENNSYLVANIA
REQUISITION NUMBER GTAC5-1-263

August 16, 2012

The Pennsylvania Department of Environmental Protection (DEP) has requested that SAIC Energy, Environment & Infrastructure, LLC (SAIC) prepare a work scope and pricing estimate for the completion of additional site characterization activities at the Hoff VC site in New Hanover Township, Pennsylvania (the Site). **Figure 1** (attached) depicts the area of the Site and Site features.

The proposed additional site characterization activities include:

- Installation of nested well screens within six newly installed bedrock monitoring wells (MW-1D, MW-2D, MW-3D, MW-4D, MW-5D, MW-6D),
- Performance of borehole geophysics, straddle packer groundwater sampling, and nested well screen installation at two additional off-site bedrock wells located south of the Site on land owned by the Gibraltar Rock quarry company (OW-4 and OW-6),
- Completion of two rounds of groundwater sampling on all the newly installed wells and the preexisting Good Oil property wells, and
- Completion of a soil vapor intrusion study at 3 residential properties within the area of the Site.

Tasks affected by this work scope are presented below in accordance with DEP work breakdown structure (WBS) task numbers.

WBS-1010- Project Planning
This task is revised to include the preparation of this work scope and change order request (Change Order 7) which has included research, subcontractor quote solicitations, nested well screen design efforts for the six existing bedrock wells, planning and coordination and other efforts to continue site, office, and field work on an expedited schedule. Additional labor is also included in this task for ongoing project planning activities including review of geophysics and borehole log data for straddle packer work scope design and straddle packer data for nested well screen design at OW-4 and OW-6.

Current funding for this task has been depleted and exceeded. Additional funding will be needed to cover costs already incurred from the preparation of this work scope and change order request and to cover future planned efforts.

WBS-2070- Report Preparation
A Preliminary Draft Project Report was prepared by SAIC and submitted to DEP in June 2012 that documented all site work completed up to that time. Additional/new funding will be needed

to perform future reporting activities that will include the straddle packer sampling work and results, the nested well installations, groundwater monitoring activities, results of the soil vapor intrusion study, updates to figures and tables, etc.

WBS-3000- Site Survey

The existing well survey will need to be updated to account for the new top of casing elevations associated with the nested wells and off-site wells OW-4 and OW-6, which were not previously surveyed.

Some of the initial Task 3000 funding remains but will not be adequate to complete the survey update. Additional funding for this task is being requested to perform the survey update.

WBS-3012- Groundwater Sampling

Monitoring Well Groundwater Sampling

DEP has requested that SAIC perform two rounds of groundwater sampling at all newly installed wells and the preexisting shallow wells at the Good Oil property. This will include 35 or more wells during each sampling event.

Samples collected from all monitoring wells will be obtained following the "micro-purging" procedures outlined below:

1. Access the well and measure the depth to groundwater and total depth of well. Calculate the total well volume using the diameter of the well casing and the height of the water column.

2. Lower pump, safety cable, tubing and electrical lines slowly (to minimize disturbance) to the targeted sampling depth using the depth to water meter to measure pump depth.

3. Purge well: start the pump at its lowest speed setting and slowly increase the speed until discharge occurs. Pumping rates should be adjusted, as needed, to match the yield of the well and minimize drawdown.

4. Collect purge water in a graduated bucket to measure volume of water produced and the pumping rate. Field indicator parameters (turbidity, temperature, specific conductance, pH, and DO) will be monitored using a typical water quality meter with flow through cell. Parameters should be monitored and recorded immediately upon the beginning of purging and every three to five minutes thereafter.

5. Purging will be considered complete and sampling may begin when three well volumes have been removed or when all the above indicator field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings, are within the following limits:
    - turbidity (10% for values greater than 10 NTU)
    - DO (10%)

- specific conductance (3%)
- temperature (3%)
- pH (± 0.1 unit)

6. Samples will be collected by filling the laboratory glassware directly from the pump tubing discharge. If the well yield is low, the well will be allowed to recover between periods of filling glassware.

7. Prepare and secure labels to filled glassware. Labels shall identify the time and date of sample collection, unique well identifier, the sampler, and the type of analysis requested.

8. Remove pump and re-secure well. Decontaminate pump using alconox or liquinox solution prior to reusing pump at the next sampling location.

Details associated with the collection of the samples will be recorded on well sample forms that include information such as sample identification, dates/times, addresses, sampler, analyses, field parameter monitoring, water levels, and other field information.

Well purge water will be treated with granular activated carbon (GAC) and discharged to the ground surface at the well head. At wells where higher levels of contaminants are suspected (MW-4, MW-8, MW-14, MW-4D), purge water will instead be drummed for offsite disposal. Water samples will be submitted to the DEP Bureau of Laboratories (BOL) for analysis of volatile organic compounds (VOCs), 1,4-Dioxane, and potentially other contaminants of concern as determined by DEP within the required holding times.

OW-4 & OW-6 Straddle Packer Sampling Work

SAIC performed straddle packer groundwater sampling activities at the six new deep bedrock monitoring wells in June 2012. A dual packer system with variable spacing options was utilized to isolate as many as five targeted fracture zones within each well. DEP has requested that SAIC perform additional straddle packer sampling work at several additional wells (OW-4 and OW-6) located off-site on land owned by the Gibraltar Rock quarry company (**Figure 1**).

The straddle packer groundwater sampling procedure was previously submitted to DEP in the June 5, 2012 Straddle Packer Groundwater Sampling Work Scope. The same methodologies will be employed when performing the work at wells OW-4 and OW-6. Target straddle packer zones will be determined by SAIC following the completion of borehole geophysics work at these wells (see WBS-3040 Geophysical Investigation below). SAIC personnel will direct and oversee the straddle packer sampling and collect and help manage groundwater samples. Purge water generated during the sampling process will be treated through new granular activated carbon and discharged to the ground surface at the well head. Details associated with the collection of the samples will be recorded on well sample forms that include information such as sample identification, dates/times, addresses, sampler, sample depth, field indicator parameters, and other important information or observations.

The initial funding for this existing task was depleted and exceeded during the June 2012 field efforts. Additional funding for this task is being requested to conduct the monitoring well groundwater sampling events (2) and additional straddle packer sampling work as proposed.

WBS-3014- Indoor Air Sampling (Vapor Intrusion Study)
In an email dated July 19, 2012 DEP requested SAIC complete a vapor intrusion study at the residences with high levels of chlorinated organic compounds in their well water. During subsequent discussions with DEP it was determined the study would be completed at three residential properties including 318 Layfield, 322 Layfield, and the multi-tenant property (324-332 Layfield).

A preliminary review of home well sample data was performed and included the comparison of home well water sample results to the Residential Volatilization to Indoor Air Criteria (Table 1) of the of the DEP Land Recycling Program Technical Guidance Manual Section IV.A.4. This exercise concluded that, although no chlorinated organic compounds detected in the home well samples exceeded the screening criteria; further investigation should be conducted based on the shallow depth to groundwater in existing and recently installed nearby monitoring wells (water levels 10 feet or less below grade).

To evaluate the potential vapor intrusion risks, sub-slab soil gas samples will be collected from beneath the basement floor at each of the target properties. If sub-slab sample analysis results exceed the applicable screening criteria, indoor air sampling will be conducted under a separate work scope and change order

The vapor intrusion study will be conducted in accordance with the guidance and recommendations provided in the following with the PA DEP regulations taking precedent where conflicting guidance is provided:

- DEP Land Recycling Program Technical Guidance Manual Section IV.A.4
- U.S. EPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (2002)
- Interstate Technology and Regulatory Council Vapor Intrusion Pathway: A Practical Guideline (January 2007).

Soil gas sample analysis results will be compared to both the EPA screening levels and the PADEP Criteria. The guidance recommends, at a minimum, two quarterly sampling events (spring and winter) for soil gas and indoor air to account for seasonal variations and when worst case conditions are likely to exist. For soil gas only, two sampling events can be conducted during the same season within two to four weeks of the initial sampling event if timing constraints are a factor. The scope of this work plan proposes one fall soil gas sampling event (September 2012) and one winter soil gas sampling event (December 2012 or January 2013).

Home Inspection and Planning Visits
Home/building inspection and planning visits will be conducted at each target property and will include an occupant survey (to assess potential indoor emission sources and evaluate dwelling ventilation systems), monitoring the basement for organic vapors using a photo ionization

detector (PID), assessment of basement conditions, accessibility, and the determination of locations for the sub-slab soil vapor probes.

The activities conducted during the Home Inspection and Planning Visits will be documented on individual survey forms designed for vapor intrusion investigations. Additionally, a PID capable of detecting parts per billion concentrations of volatile organic compounds (VOCs) will be used to scan structure basements for background concentrations of VOCs in ambient air and potential soil gas emanating into the basements through cracks, drains, seams, etc. in floor slabs.

Soil Gas Sub-slab Probe Installation

Sub-slab soil gas probes will be installed in the basements of the targeted residences. DEP guidance does not specify a minimum number of sub-slab probes or samples per structure. EPA guidance recommends a series of small diameter holes into which probes are installed at locations closer to the center of the slab and well away from the edges where dilution is likely to occur. EPA also recommends collecting sub-slab samples at several locations in order to obtain representative values. Sub-slab soil gas probes will be installed at a frequency of one probe for every 300 square-feet of basement area (20'x 15'). This is expected to result in the installation of 2 to 3 sub-slab probes per structure. If a functioning radon mitigation system is present at any of the properties, an air sample will be collected from the abatement system effluent in lieu of installing sub-slab probes.

The sub-slab probes will be installed at locations determined during the Home Inspection and Planning Visit. At selected basement locations, a small hole (1-inch diameter) will be drilled through the concrete floor slab and approximately four inches into the sub-base material. A pre-constructed stainless steel screen implant (3-inch length) and stainless steel tube will then be inserted into the open hole and positioned to monitor the space directly below the floor slab or sub-base aggregate as recommended by EPA. The space between the probe and concrete floor will be sealed with cement to prevent short circuiting. The top of the probe will be finished flush with the concrete floor pad and secured with a threaded plug that can be removed for attachment of sampling fittings.

One of the residences is an older farmhouse structure and may not have an improved floor (dirt floor). In this instance, one or more soil vapor implants will be installed into the subsurface below the dirt floor using a two-inch bucket hand auger. The implants will be approximately six-inches in length, constructed of a stainless steel mesh, and attached to one-quarter inch Teflon lined poly tubing. The implants will be installed several feet below the floor surface (if bedrock is not present) and above the water table. The annular space of the borehole surrounding the implant screen will be backfilled with small diameter glass beads. A mixture of bentonite and sand will be used to fill the remainder of the borehole to just below grade. The soil vapor implant will be completed in a small, flush-mount manhole that is level with grade and the end of the tubing within the manhole will be properly capped.

SAIC will prepare sub-slab probe/soil vapor implant construction logs that document the construction of the probes and vapor points and other observations recorded/noted during installation.

Sub-slab Soil Gas Sampling Events

Two sub-slab soil gas sampling events are proposed, one in the fall of 2012 and one during the following colder winter months. This first sampling event will be conducted approximately one week after the probes and well points have been installed. Sampling will be performed by connecting 6-liter evacuated Summa® passivated canisters to the probes (or implants). Prior to initiating the sampling process, the probes (or implants) will be purged of stagnant air and the basement background air and soil vapor from within the probes will be scanned with a PID to gauge the levels of ambient volatile organic vapors. Each soil gas sample will be collected as a grab sample over a period of one hour. The potential for leakage of atmospheric air or background contaminants into the sample will be addressed by using helium gas as a tracer. Helium will be discharged into a shroud emplaced around the sampling point, Summa® canister, and associated sample tubing. The presence of a helium atmosphere within the shroud will be monitored with an appropriate gas detector. Details associated with the collection of samples will be recorded on a standard soil vapor sample field form and will include information such as canister ID number, location, temperatures, initial pressure, sample collection time, final pressure, helium monitoring, and any other relevant or pertinent information.

Soil gas samples will be analyzed for chlorinated VOCs and helium by a commercial laboratory capable of performing the helium analysis (e.g. Eurofins, formerly Lancaster Laboratories, Inc of Lancaster, Pennsylvania) under subcontract with DEP. SAIC will obtain the required sample containers and calibrated flow controllers for the samples from the laboratory. Samples will be transported by SAIC/Lancaster Labs under formal chain of custody procedure and will be submitted for analysis of VOCs by USEPA Method TO-15 and will also include helium by ASTM D1946. Quality assurance samples will be analyzed for the same analytical suite as the regular samples and will consist of duplicate samples at a rate of 10% (1 duplicate for every 10 regular samples), an ambient air blank sample each day covering the time span of the regular sample collection, and one trip blank sample.

New funding is being requested to perform the above Task 3014 activities.

WBS-3030- Monitoring Point Installation

Nested Well Installations

DEP has requested the installation of nested well screens within the recently installed deep bedrock monitoring wells (MW-1D, MW-2D, MW-3D, MW-4D, MW-5D, and MW-7D). The purpose of the nested wells is to target specific water bearing fracture zones for sampling and monitoring.

Currently the monitoring wells are constructed as six-inch diameter open borehole wells with six-inch steel casing extending to a depth of approximately 40 feet below grade. Two nested wells consisting of two-inch diameter PVC screen and riser pipe will be installed at each monitoring well. The attached table presents the proposed screened depths and general well construction details for each nested well. The proposed well screen intervals were selected to enable monitoring of several, separate water bearing zones at each well. The screened intervals were determined from review of straddle packer sample results, field data, borehole geophysics information, and drilling logs.

SAIC proposes to construct the nested well screens by the following sequence:

1. The lower portion of the borehole will be backfilled with bentonite chips or a cement grout to approximately 2 feet below the proposed lower screen depth. Sufficient time must be allotted to allow chips to hydrate and expand or for the grout to begin setting up. The depth of the well materials shall be routinely monitored via a tremie pipe (if used for material placement) or a weighted tag line.
2. Approximately 2 feet of coarse sand (#2 or greater) will be placed above the bentonite chips.
3. Lower Screen: 2-inch diameter, threaded, schedule 40 screen and riser pipe will be slowly lowered into the well to the target depth. The screen shall be 40-slot (0.04 inch) with a threaded end cap or sump attached to the bottom. Following installation to target depth the riser pipe shall be labeled with the appropriate well name and screen depth.
4. A sand pack shall be emplaced around the lower screen. The sand pack shall consist of coarse sand (#2 or greater) and shall be slowly poured into the borehole. The sand pack shall extend approximately 2 feet above the top of the lower screen interval.
5. A 3 foot seal shall be emplaced above the lower screen sand pack using bentonite chips.
6. A pre-mixed bentonite slurry (Volclay or similar) shall be placed via tremie pipe above the bentonite chips to a depth of approximately 4 feet below the bottom of the upper screen depth.
7. Approximately 2 feet of bentonite chips shall be placed above the bentonite slurry.
8. Approximately 2 feet of coarse sand (#2 or greater) shall be placed above the bentonite chips.
9. Upper Screen: 2 inch diameter, threaded, schedule 40 screen and riser pipe will be slowly lowered into the well to the target depth. The screen shall be 40 slot (0.04 inch) with a threaded end cap or sump attached to the bottom. Following installation to target depth the riser pipe shall be labeled with the appropriate well name and screen depth.
10. A sand pack shall be emplaced around the upper screen. The sand pack shall consist of coarse sand (#2 or greater) and shall be slowly poured into the borehole. The sand pack shall extend approximately 2 feet above the top of the upper screen interval.
11. A 3 foot seal shall be emplaced above the upper screen sand pack using bentonite chips.
12. A premixed bentonite slurry (Volclay or similar) shall be placed via tremie pipe above the bentonite chips to a depth of approximately 20 feet below the top of the PVC well casings.
13. The remaining 20 feet of the borehole annulus is to be filled with a Portland cement/bentonite grout to 6 inches below the top of the PVC well casings to secure the well materials and prevent upward expansion at the top of the well.

A construction diagram for a typical nested well is attached. Well water displaced from the well during the nested well screen installation will be captured at the wellhead in a containment structure or directly routed into 55-gallon drums or a poly-tote container. The well water will then be pumped through a GAC unit containing fresh carbon and discharged to the ground surface. Water from MW-4D is expected to contain higher contaminant concentrations and will instead be containerized in 55-gallon drums for later removal and proper disposal by an IDW subcontractor.

Nested well installations are also planned at off-site wells OW-4 and OW-6. The design and installation of the nested well screens in these wells will be performed following the completion of the borehole geophysics and straddle packer sampling work that is currently scheduled to be conducted at these wells in the near future.

Current funding for this task has been nearly depleted. Additional funding is being requested to complete these additional Task 3030 activities.

WBS-3040- Geophysical Investigation
Borehole geophysics were performed on the six new deep bedrock monitoring wells following installation in April 2012. DEP has requested the performance of additional borehole geophysical logging at the two off-site wells OW-4 and OW-6.

A suite of borehole geophysical logs will be conducted to provide information related to character (porosity and permeability) and thickness of geologic units, location and strike and dip of fractures/joints and lithologic contacts, location of water producing and water receiving zones, and the direction and rate of vertical flow within the borehole. The specific logs will include:

- Caliper,
- Natural Gamma,
- Conductivity
- Normal Resistivity,
- Temperature,
- Heat Pulse Flow,
- Acoustic Televiewer

Upon completion of the logging fieldwork, a data package will be produced that will include the logs with analysis/interpretation.

Current funding for this task has been depleted. Additional funding is being requested to complete the additional borehole geophysics work at OW-4 and OW-6.

WBS-3080- Investigation Derived Waste (IDW) Disposal
IDW is expected to be generated during several different phases of the additional characterization work. Monitoring well purge water will be generated, containerized, and disposed from selected wells during the groundwater sampling events under Task 3012 and the nested well installation work under Task 3030. The purge water will be containerized in 55-gallon drums and temporarily staged at the Henkels & McCoy facility pending removal and disposal. The drummed water will be removed and disposed by Veolia Environmental Services, Inc. at the Environmental Recovery Corporation facility in Lancaster, PA under the existing waste profiles.

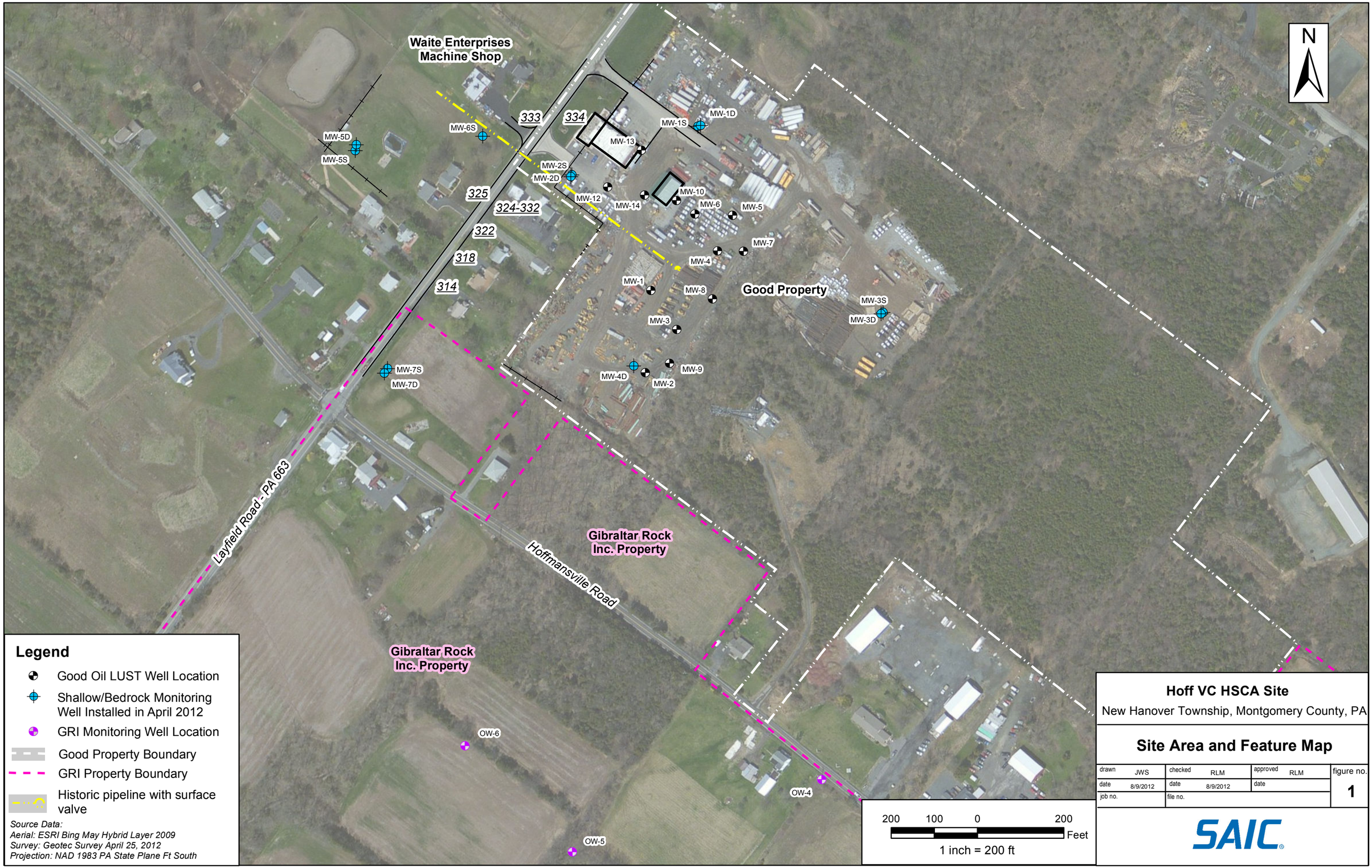
Current funding for this existing task has been nearly depleted. Additional funding is being requested to complete the additional Site characterization work activities.

COST ESTIMATE

The cost for the above work scope items discussed above is presented in the attached summary table and is summarized by DEP Work Breakdown Structure (WBS) Tasks.

SCHEDULE

SAIC has already begun planning and coordinating the proposed additional Site characterization activities. The borehole geophysics work at offsite wells OW-4 and OW-6 has been completed and straddle packer sampling work at those wells is scheduled for the week of August 20th. SAIC is currently working on the straddle packer sampling strategy for the individual wells and is soliciting bids from well installation contractors for the installation of the nested well screens so that work can be completed in late August or early September 2012. Other activities will be initiated upon the issue of funding for the proposed tasks.



Hoff VC HSCA Site

New Hanover Township, Montgomery County, PA

Site Area and Feature Map

drawn JWS	checked RLM	approved RLM	figure no. 1
date 8/9/2012	date 8/9/2012	date	
job no.	file no.		

SAIC

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Proposed Nested Well Screens

Hoff VC Site

New Hanover Township, Montgomery County, Pennsylvania

Well	Well Diameter (inches)	Screen Length (feet)	Casing Length (feet)	Total Depth of Well (fbg)	Screened Interval (fbg)	Top of Casing Elevation AMSL (feet)	Top of Screen Elevation AMSL (feet)	Bottom of Screen Elevation AMSL (feet)	Latitude	Longitude	Notes:
Monitoring Well											
MW-1D-Upper	2	150	40	200	50 - 200	419.5	369.5	219.5	40.329534	-75.554923	Opening: 0.040 Slot
MW-1D-Lower	2	60	40	300	240 - 300	419.1	179.1	119.1	40.329540	-75.554902	Opening: 0.040 Slot
MW-2D-Upper	2	70	40	120	50 - 120	416.2	366.2	296.2	40.329233	-75.555992	Opening: 0.040 Slot
MW-2D-Lower	2	30	40	230	200 - 230	416.6	216.6	186.6	40.329245	-75.555981	Opening: 0.040 Slot
MW-3D-Upper	2	60	40	110	50 - 110	410.6	360.6	300.6	40.328311	-75.553442	Opening: 0.040 Slot
MW-3D-Lower	2	30	40	180	150 - 180	411.2	261.2	231.2	40.328322	-75.553425	Opening: 0.040 Slot
MW-4D-Upper	2	30	40	120	90 - 120	405.9	315.9	285.9	40.328022	-75.555506	Opening: 0.040 Slot
MW-4D-Lower	2	30	40	250	220 - 250	400.6	180.6	150.6	40.329470	-75.557766	Opening: 0.040 Slot
MW-5D-Upper	2	40	40	95	55 - 95	400.9	345.9	305.9	40.329433	-75.557775	Opening: 0.040 Slot
MW-5D-Lower	2	50	40	190	140 - 190	412.5	272.5	222.5	40.329506	-75.556714	Opening: 0.040 Slot
MW-7D-Upper	2	70	40	155	85 - 155	384.3	299.3	229.3	40.328014	-75.557582	Opening: 0.040 Slot
MW-7D-Lower	2	30	40	210	180 - 210	385.3	205.3	175.3	40.328042	-75.557553	Opening: 0.040 Slot

Nested Well Screen - General Construction Diagram