September 24, 2009

Mr. William Lamb
PO Box 488
Woodstock, VT 05091

Subject: Soil Delineation Results, Former A+B Motors, 25 South Street, Woodstock, VT (SMS# 2008-3784)

Dear Mr. Lamb,

This report details the findings of the Soil Delineation Study conducted at the former A&B Motors site in Woodstock, VT on August 7, 2009 by Harper Environmental Associated (HEA). The delineation of petroleum hydrocarbon impacted soil was requested by the State of Vermont Department of Environmental Conservation (VTDEC) in a letter dated July 31, 2009. The purpose of the study was to collect significant soil data from the soil boring array to aid in planning a remediation design, as well as to refine soil extraction quantities during the soil removal program. Figure 1 is a Site Locus Map and Figure 2 indicates the proposed soil boring locations.

Background
A number of reports, letters and facsimiles were reviewed prior to the completion of the soil delineation program. Griffin International (GI), KAS and Harper Environmental Associates (HEA) completed all of the initial investigation work. The major reports include:

- *Phase I ESA,* Dubois and King, February 13, 1997
- *UST Closure Inspection*, GI, March 11, 2002
- *Initial Subsurface Investigation Report,* GI, October 2002
- *Magnetometer Scan by GI;* No Report-only referenced by DEC Correspondence
- *Additional Groundwater Sampling Report,* GI, March 25, 2003
- *Monitoring Well Abandonment Letter,* GI, April 2004; *SMAC Letter* April 2004
- *Phase II Environmental Site Assessment,* KAS, January 2008 (from a Brownfieldôs grant offered to the Town of Woodstock, VT)
- *UST Closure Report: 1,100 Gasoline UST*, HEA, May 26, 2008
- *Monitoring Well Installation and Groundwater Monitoring Results,* HEA, July 23, 2008
- *November 2008, Monitoring Well Installation and Groundwater Sampling Report*, HEA, January 30, 2009

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Summary of Past Reports

- During the completion of a Phase I ESA from September 1997, no evidence of registered USTs was determined. Two gasoline USTs were removed, however, no environmental assessment was documented or subsequently reported to the Vermont Department of Environmental Conservation, Waste Management Division, Sites Management Section (VTDEC SMS).
- During the closure of a 500-gallon fuel oil UST in 2002, elevated VOCs were detected in soil samples.
- A 2003 subsurface investigation indicated that no significant soil or groundwater contaminants existed in the three MWs and two soil borings installed at the Site. Minor MTBE levels, a gasoline additive, were detected from one MW although below the VT State Standards.
- A continued subsurface investigation was completed in March 2003. Groundwater samples from three MWs were analyzed for VOCs. Only low levels of MTBE were detected from one MW, again below VT State Standards. A closure letter (SMAC, Sites Management Activity Completed) for this Site was requested from the VTDEC.
- On April 2004, the three MWs were abandoned. On April 29, 2004, a SMAC letter from the VTDEC was offered to the property based on a lack of groundwater/soil contamination.
- Due to potential interest in acquiring the site, a geophysical evaluation, under a Brownfieldôs grant (Phase II ESA), was completed during November 2007. Aò500-gallon USTò was believed located along the property near South Street.
- Nine test pit and shallow soil borings were completed during November 28, 2007. Bedrock was encountered between 4- 6 feet below grade (fbg) near the toe of the west side of the property. Strong petroleum odors were detected in all of the pits except the background pit.
- VOC, PAH and metals exceedances were found in the shallow soil boring samples completed on November 28, 2007. Other media was tested during the completion of the Phase II ESA.
- On May 23, 2008, a 1,100-gallon gasoline UST, located north of the concrete pad, was removed from the property. The UST was reported to be in poor condition with several holes located along the bottom seam of the tank.
- Four additional monitoring wells (MW-7, 8, 9, 10) were drilled along the eastern edge of the property on May 23, 2008. During the well installation, MW-9 and MW-10 registered elevated levels of petroleum vapors in the soil measuring 1,600 and 2,000 parts per million (ppm) respectively.
- Phase-separated liquid was present in both MW-9 and 10 during the groundwater sampling event completed on June 16, 2008. SVOCs and lead concentrations were also found above the VGES in MW-7, 9, and 10.
- Four additional groundwater monitoring wells (MWs) were installed, on October 30, 2008, on the easterly side of VT Route 106, directly east of the former A+B Motors site to further define the extent of the groundwater and soil impact.
- A November 2008 report entitled òMonitoring Well Installation and Groundwater Sampling Reportò further identified a phase-separated area in the vicinity of the former pump island.
- Based on the occurrence of phase-separated liquid in MW-9 and MW-10, a source removal/soil excavation program was planned and approved by VTDEC.

Delineation of Petroleum-Contaminated Soils

Soil Boring Installation

On August 7, 2009, T+K Drilling and HEA met on site to complete the soil delineation program. Prior to arriving on site, Dig-Safe marked out the site utilities, and the site was also screened with a magnetic locator. A total of 15 soil borings were advanced in and around the former concrete apron/pump island as part of the soil delineation study (Figure 3) under the direction of a professional geologist. Continuous soil samples were taken from all borings. Other soil borings were planned; however, the drill rigôs hydraulic system failed and the borings could not be completed.

Soil Screening Results

The extracted soil samples were screened continuously with a PID during the completion of the 15 soil borings. A summary of the highest PID readings at depth is displayed in Figure 5 as well as in Table 1 below. A north to south profile of the soils encountered during the soil boring program and the related PID readings can be seen in Figure 4. The table below lists all of the PID readings at depth from the soil borings. The bolded boxes indicate PID levels in soil greater than 100 PPM.

The soil logs from the north-soil profile depicts a peat layer from 3-6 fbg in three of the borings, however; the peat layer is deeper in SB-2 (6-9 fbg).The bulk of the soils contaminated by petroleum hydrocarbons extend from the area included in the phase-separated zone, as depicted in the November 2008 groundwater report, westerly to a point at soil boring (SB) 14 (Figure 5). The east to west axis of the soil impacted >120 PPM is 40 feet. This extends from the edge of the sidewalk to SB-14.

The highest PID readings in soil (1,200 to 8,200 PPM) were encountered from SB-11, SB-2 and SB-3. Soils proximate to SB-11 (4282 PPM) and SB-2 (8200 PPM) displayed the highest readings at 9 to 10 feet below grade (fbg). The highest PID level from SB-3 (1200 PPM) was detected at 6 fbg. The depth-to-water measurements from this area during November 2008 were 6.1- 6.3 fbg.

TABLE 1: PID READINGS IN SOIL BORINGS (DEPTH/PPM)						
1	**2**	**3**	**4**	**5**	**6**	**7**
1.5/24	2.5/0	3.5/5	4/15	4/42	**4.5/210**	3/11
4.1/450	**5.5/159**	**6/1200**	REFUSAL	6/70	7.5/55	4/25
REFUSAL	**6/159**	**9/137**		8/45	9/10	6/27
	9/8200	10/55		9/32		7/0
	10/3200					9/25
	11/1400					
	12/315					

PID READINGS IN SOIL (DEPTH/PPM)							
8	**9**	**10**	**11**	**12**	**13**	**14**	**15**
3/0	3/0	3/0	3/0	3/11	3/0	3/12	3/0
6/42	4.75/0	6/4	5/50	**6/120**	**5.5/165**	**6/120**	5/0
7.5/21	REFUSAL	5/10	6/22	9/52	6/20	9/10	6/0
9/0		9/27	8/22	10.5/33	9/15	11/3	9/20
			9/365				
			10/4282				
			11.5/27				

Soil Contamination in Relation to Groundwater

The highest PID readings measured during this study were from soil borings SB-2 and SB-11 and were detected below the water table, based on the November 2008 groundwater gauging data. Borings SB-1 and 3 indicated significant soil contamination at or above the water table. PID readings up to 1200 ppm were detected at a depth of 6 fbg in SB-3.

SB-11 was installed through the former pump island. VOC impact in soil measured in SB-11 and SB-2 could be the result of leaking UST conveyance system piping during a time of a lower water table. These readings could also have originated from a failed UST.

Anticipated Area of Excavation

During the June 2008 groundwater sampling event, phase-separated product was measured in MW 9 and 10. During the UST removal 0n May 26, 2008, HEA screened soil up to 320 ppm of VOCs from the tank cradle. Base on an overlay of the PID measurements at depth from this soil delineation study, we found highly-impacted soil from a depth of 9 to 11 fbg in an area stretching from the sidewalk near MW 10 towards SB-3 during soil excavation activities.

This ñdeepò impacted zone (9-11 fbg) includes the highly impacted soils measured from SB-2. The deep zone appears to be separated from a ñshallowò impacted zone. The shallow zone includes soil from 4-6 fbg in an area bounded by SB-1, SB-6, SB-3 and MW-10.

Calculations: ñDeepò Zone- ~30ô long x 10ô wide x 3ô thick = 900 cubic ft or <u>33 cubic yds.</u> of soil.
ñShallowò Zone- ~35ô long x 15ô wide x 3ô thick = 1,575 cubic ft or <u>58 cubic yds.</u> of soil.

If the impacted soil from both zones could be excavated, we anticipate that approximately 184 cubic yards of soil will be handled during the excavation, and out of this amount approximately half or 91 cubic yards of soil would be containerized for disposal by thermal desorption at the ESMI facility in Loudon, NH.

Our initial estimate of soil excavation prior to the soil delineation program estimated ~ 145 yds. of impacted soil needing disposal with 110 yards of clean soil stockpiled onsite for reuse.

Conclusions and Observations

- The soils surrounding the former pump island contain the bulk of the soil impacted by petroleum hydrocarbons as identified by PID screening during this study (Figure 5).

- The highest PID readings in soil were detected between 10-11 feet below grade, which is currently below the water table. Groundwater was gauged at approximately 6.2 feet below grade at this time last year. The groundwater level in MW-10 was gauged on September 25, 2009 at 7.32 fbg.

- Seasonal low levels in groundwater typically occur in the northeast during the fall/winter months. The groundwater has dropped by more than a foot since the summer months.

- A two to three-foot thick dark peat layer was encountered between 3 and 9 fbg across the study area.

- The highest PID readings and the largest above groundwater/ soil contamination zone exists within a 15 foot radius from the former pump island.

- PID readings indicated two contaminated zones: one between ~4-6 fbg and the other below the present water table between ~9-11 fbg. A two to three-foot zone of uncontaminated soil separates the upper and lower zones in some locations.

- No significant residual source of soil contamination was discovered from the surface grade to 3 to 4 fbg during the soil delineation project.

- The soil contamination and phase-separated product likely extends under the sidewalk bordering the site to the east, and possibly extends under Route 106.

Recommendations

- Soil excavation below the water table is not a feasible option; consequently we do not recommend the excavation of any soils below the water table at this time unless a dewatering/water treatment system is designed, or if the groundwater drops to below 10-11 fbg.

- We recommend removing the 58 cubic yards of ñshallowò soil during the fall of 2009. The soil will be transported to ESMI for thermal desorption processing.

- We may recommend the installation of an oxygen injection system upgradient of the soil contamination identified during this study. Soil contamination will remain below the water table and will continue to contribute to the groundwater contamination. Favorable site conditions would allow for the effective use of oxygen injection to remediate the site of residual petroleum hydrocarbon contamination.

- After the shallow soil excavation is completed, a full round of groundwater sampling should be completed. Prior to groundwater sampling, we also recommend replacing several of the monitoring wells that appear to be in poor condition.

If you have any questions with the summary of the soil delineation results, please call us at your convenience. Thank you for this opportunity to work with you.

Sincerely,
Harper Environmental Associates, Inc.

Cliff Harper, PG
Principal Hydrogeologist

Wm. Keith Harrison
Project Scientist

cc: Mr. Alex Geller, Sites Management Section, VTDEC, Brownfieldôs Response Program

Attachments: Figures 1-5

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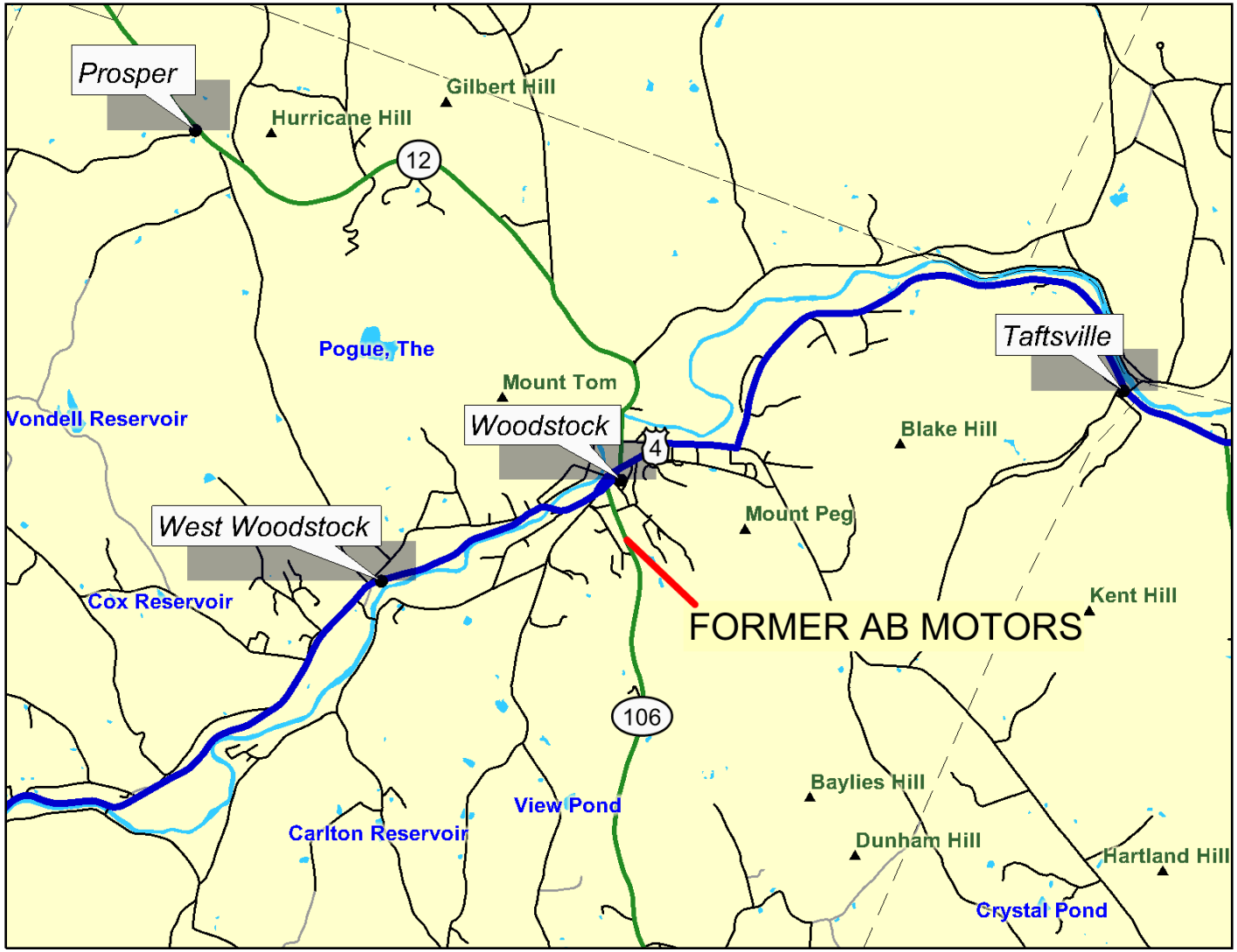
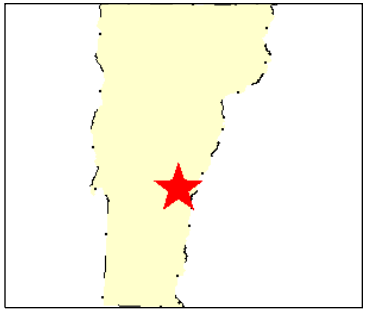
Vermont Interactive Map Viewer

Vermont Center for Geographic Information (VCGI)

Fig 1 Site Locus





Legend

- Airports
- Mountains and Hills
- Interstates
- US Highways
- VT State Highways
- Rail Lines
- Town Boundaries
- Roads
  - Class 1-3
  - Class 4
- Rivers and Lakes
- Cities
- VT State Boundary

0 5000 10000 15000 ft.

Map center: 498497, 124922

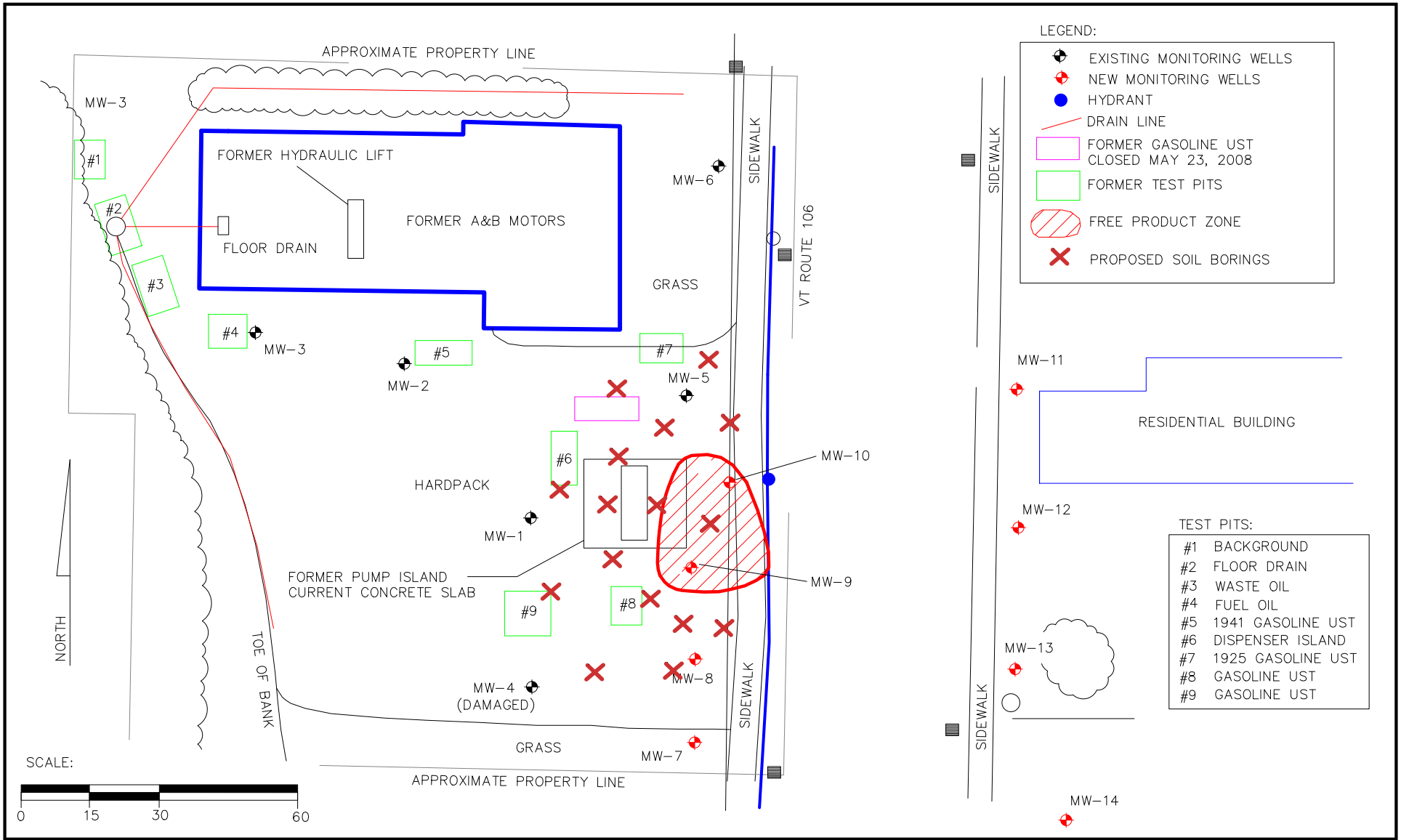
VT State Plane Meters (NAD83)

Scale: 1:52,562

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. VCGI and the State of Vermont make no representations of any kind, including but not limited to the warranties of merchantability or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

URL: http://maps.vermont.gov/imf/sites/VCGI_basemap/jsp/launch.jsp

9/24/09



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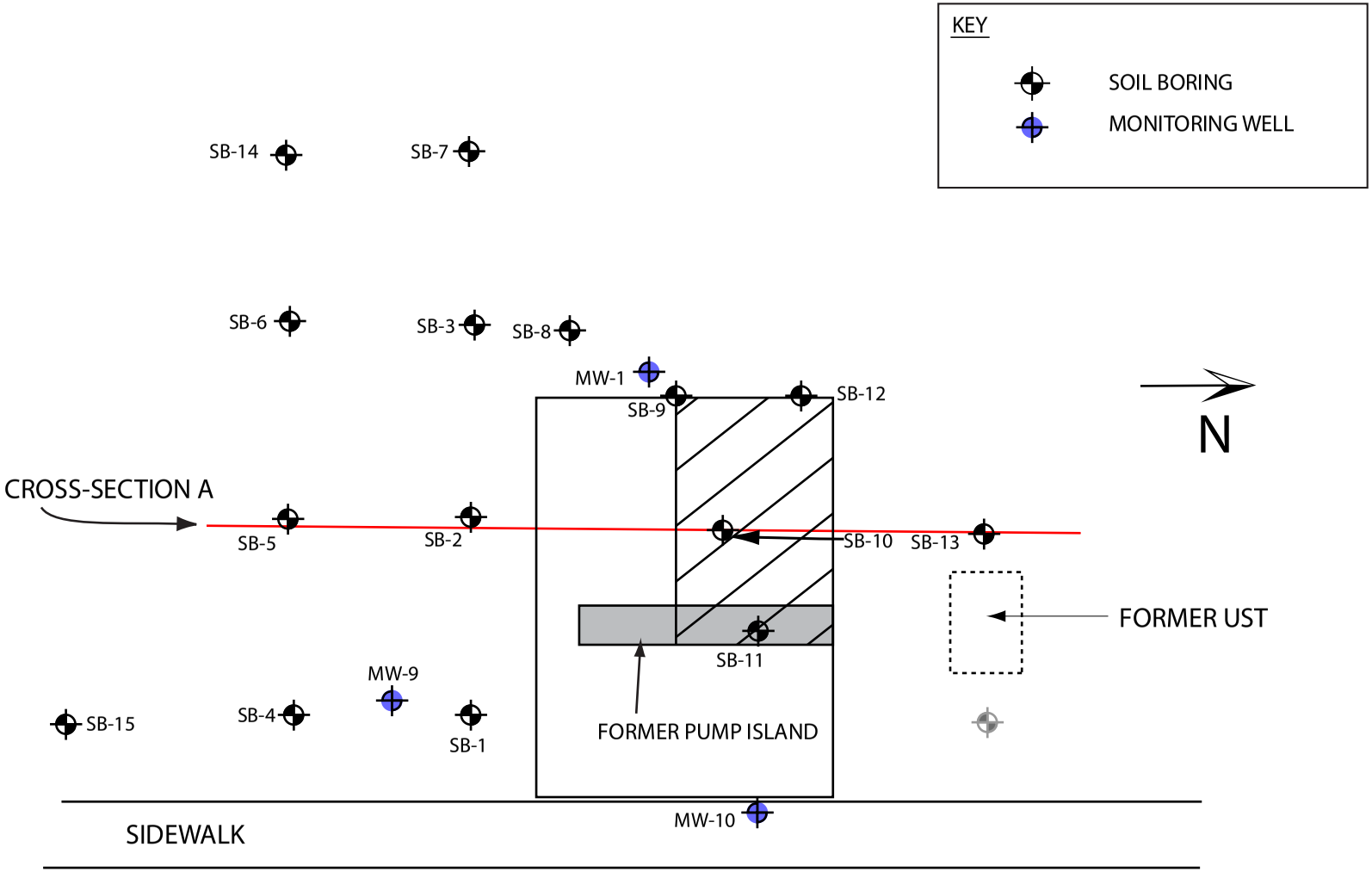
charper@sover.net

PROPOSED SOIL BORINGS
FOR
FORMER A&B MOTORS
WOODSTOCK, VT

SCALE:	
DESIGNED BY: CJH	
DRAWN BY: KA	
CHECKED BY: CJH	
DATE: 4/7/08	
PROJ.NO.	

FIGURE
2



ELEVATION: 715 FT
LATITUDE & LONGITUDE:
43°37′16.35″N 72°31′08.02″W
source: Google Earth

10′ 5′ 0′ 10′ 20′
1″ = 10′

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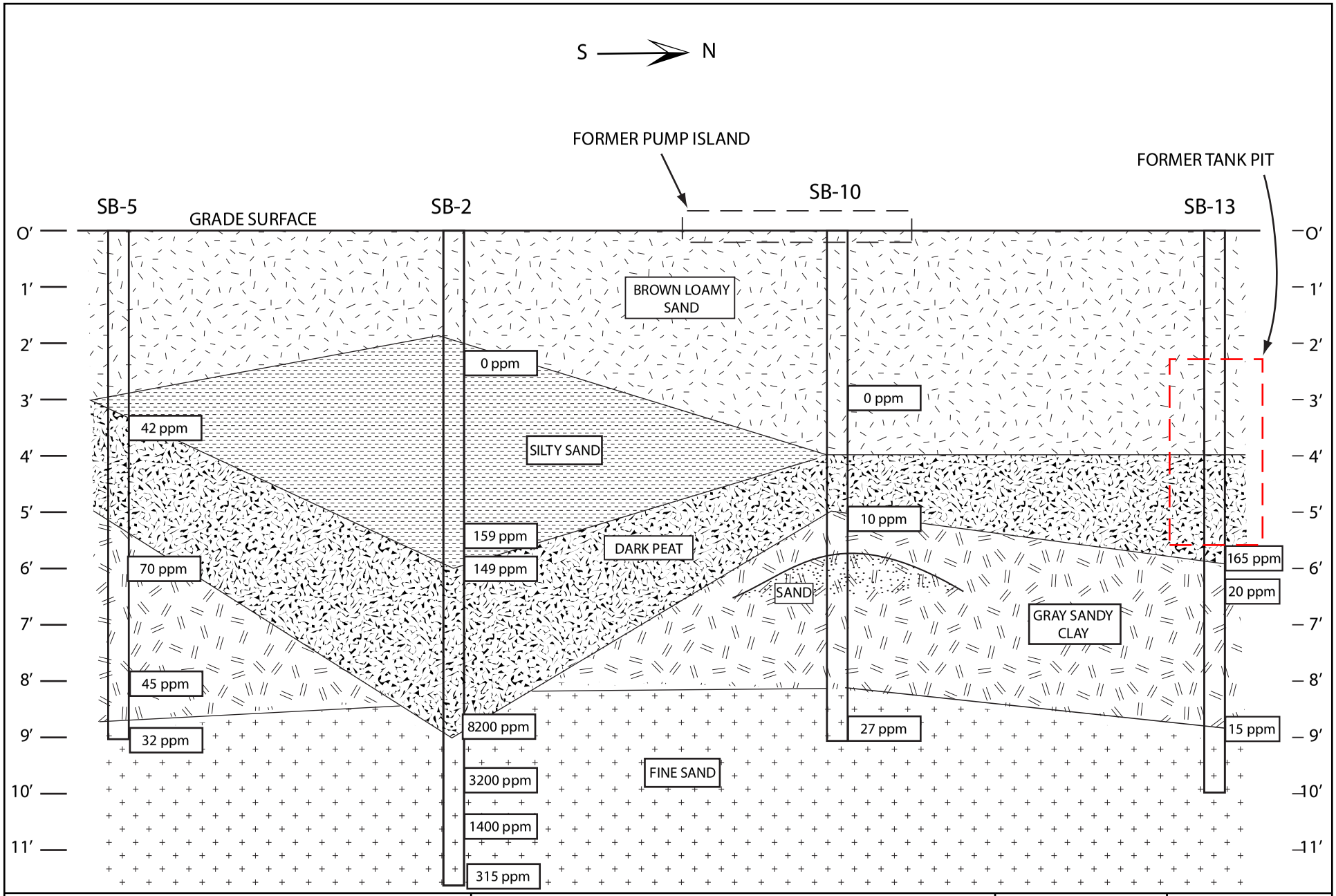
SITE MAP AND SOIL CROSS-SECTION A
FORMER A & B MOTORS
Woodstock, Vermont

SCALE:
DESIGNED BY: KH
DRAWN BY: KH
CHECKED BY:CH
DATE: Sept. 16, 2009
PROJ. NO.

FIGURE
3



HEA

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SOIL PROFILE A

FORMER A & B MOTORS

Woodstock, Vermont

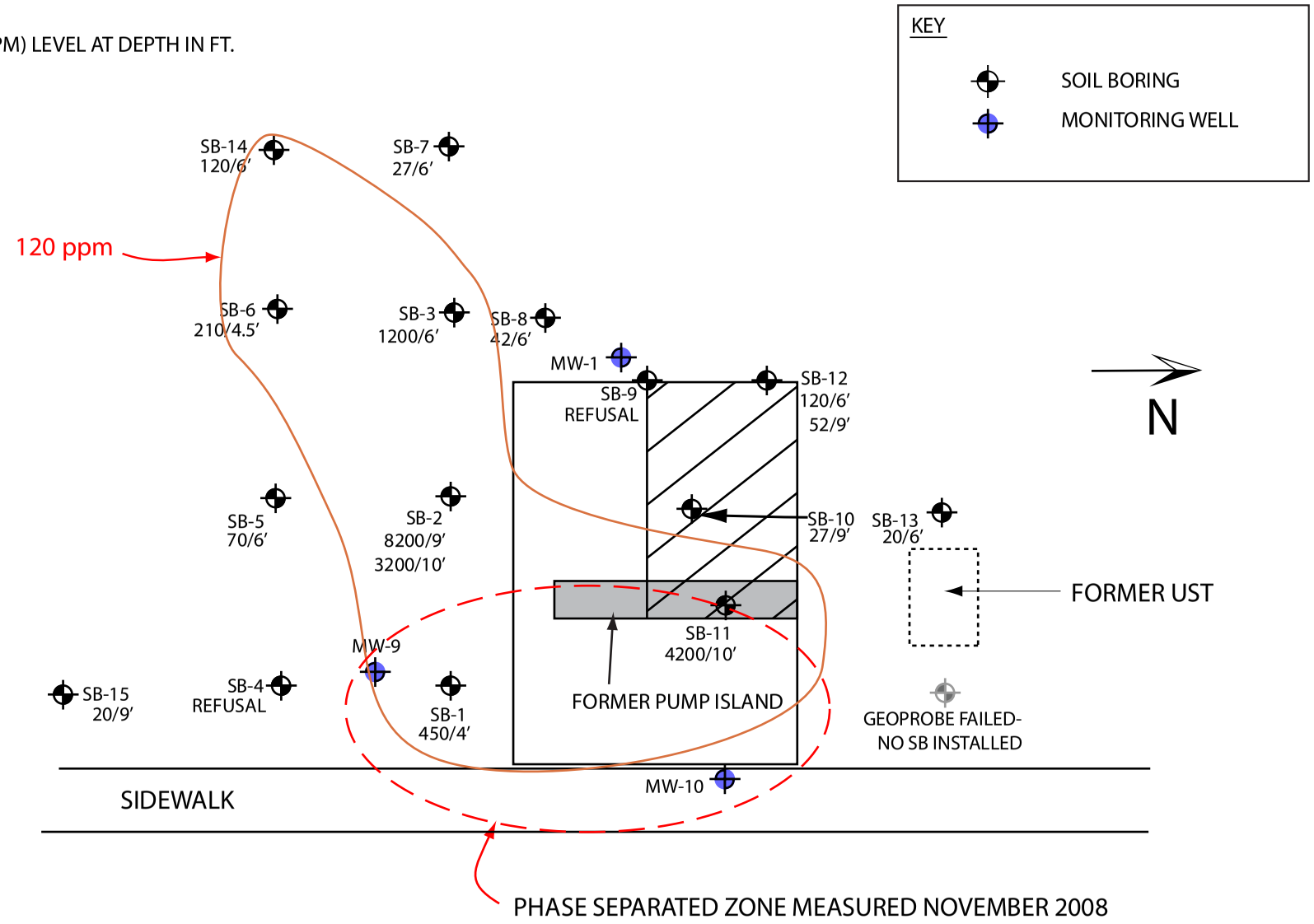
SCALE:
DESIGNED BY: KH
DRAWN BY: KH
CHECKED BY:CH
DATE: Sept. 16, 2009
PROJ. NO.

FIGURE

4

LEGEND

42/6′ = HIGHEST PID (PPM) LEVEL AT DEPTH IN FT.



ELEVATION: 715 FT
LATITUDE & LONGITUDE:
43°37′16.35″N 72°31′08.02″W
source: Google Earth

10′ 5′ 0′ 10′ 20′

1″ = 10′

HEA

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PID READINGS AT DEPTH &
120 PPM CONTOUR LINE IN SOIL

FORMER A & B MOTORS

Woodstock, Vermont

SCALE:
DESIGNED BY: KH
DRAWN BY: KH
CHECKED BY:CH
DATE: Sept. 16, 2009
PROJ. NO.

FIGURE
5