

December 22, 2008

Washington State Department of Ecology  
Toxics Cleanup Program  
300 Desmond Drive  
Lacey, Washington 98504

Attention: Marv Coleman

Subject: Letter Report  
Additional Montesano Data Management  
Montesano, Washington  
File No. 0504-045-00

## INTRODUCTION AND PROJECT UNDERSTANDING

This letter presents a summary of our data management activities performed from November 2007 through December 2008. This project is being implemented under SAIC's contract with the Washington State Department of Ecology (Ecology), Contract No. C0700034, as Task Order Release No. 4400154676. GeoEngineers is a teaming partner of SAIC's for the Ecology contract.

The subject area is generally comprised of the downtown area of Montesano, Washington (see the Vicinity Map, Figure 1). For this study, the subject area is bounded on the north by Pioneer Avenue, on the south by the Burlington Northern Santa Fe (BNSF) rail line, on the east by Church Street and on the west by 1<sup>st</sup> Street South, as shown on Figure 2. The subject area contains several parcels with former and current service stations that have or have had leaking underground storage tanks (LUSTs). Gasoline and chemical compounds (benzene, ethylbenzene, toluene and xylenes [BETX]) found in gasoline are present in both soil and water at the subject area. It is difficult to identify the extent of contamination associated with each release, because there is a possibility that the plumes from the various releases have co-mingled or been affected by subsurface utility corridors.

The goals of these services are: 1) to revise the existing geographic information system (GIS) database by incorporating additional hydrologic, and soil and groundwater chemical analytical data, and 2) to use the revised database to generate new maps of the downtown Montesano area displaying additional data points, estimated groundwater surfaces and chemical concentrations in groundwater, and potential seasonal variations in the groundwater surfaces and groundwater chemical concentrations. This data presentation will be used by Ecology to direct future exploration activities in the downtown Montesano area.

For this project, we have updated the existing GIS database with location, hydrologic and chemical analytical data from seven reports provided by Ecology. The titles of these reports are listed below, with a full citation included in the References section of this report.

1. Remedial Investigation Report, Brumfield Twidwell/Kolb Property, 301 East Pioneer Avenue, Montesano, WA 98563," May 5, 2006.

2. Second Quarter Groundwater Monitoring/Sampling Event, Former Bumfield-Twidwell [sic] Site, 301 East Pioneer Avenue, Montesano, Washington 98563," September 18, 2006.
3. Third Quarter Groundwater Monitoring/Sampling Event, January 2007, Former Brumfield-Twidwell Site, 301 East Pioneer Avenue, Montesano, WA 98563, January 29, 2007.
4. Groundwater Monitoring/Sampling Event, July 2007, Tony's Short Stop, 326 Main Street, Montesano, WA 98563," August 6, 2007.
5. Supplemental Remedial Investigation, Tony's Short Stop, 326 Main Street, Montesano, WA 98563, December 6, 2007.
6. Montesano Farm & Home, Modified Phase II Report," January 20, 2006.
7. Hart Crowser, "Remedial Investigation and Preliminary Cleanup, Pedersen Property, Montesano, Washington," Project No. 17330-03, report on CD-ROM, June 28, 2007.

### **SCOPE OF SERVICES**

The scope of our services was to incorporate additional hydrologic, and soil and groundwater chemical analytical data into the existing GIS database. The revised database was used to generate new maps of the downtown Montesano area displaying additional data points, estimated groundwater surfaces, chemical concentrations in groundwater, and potential seasonal variations in the groundwater surfaces and groundwater chemical concentrations. The specific services included the following tasks.

#### **TASK 1: INCORPORATE NEW INFORMATION INTO THE GIS DATABASE**

Consolidate additional hydrologic and chemical analytical data for soil and groundwater from new data sources and load this information into the existing GIS database. We originally assumed that this task would involve adding four separate data packages from other sources, and that these data would be available in an Environmental Information Management (EIM)-acceptable format. We further assumed that data from up to 20 samples including BETX and total petroleum hydrocarbons (TPHs) results may be entered manually if not in EIM-ready format.

#### **TASK 2: GENERATE REVISED LOCATION MAPS, ANALYZE FOR SEASONAL VARIATIONS AND PREPARE ISOCONCENTRATION MAPS**

This task included the following elements:

- Use the revised GIS database, including the additional information added in Task 1 above, to generate revised maps of Montesano focused on the downtown core area, displaying existing and additional exploration/data locations.
- Review hydrologic data contained in the GIS database for potential seasonal variations in groundwater elevations, and prepare maps that describe these seasonal variations.
- Once any seasonal variations have been identified, generate isoconcentration maps of chemicals of concern in groundwater in the downtown Montesano area for various seasons, as appropriate. These isoconcentration maps would be developed using appropriate kriging methods to represent and display groundwater chemical concentration data.

### **TASK 3: MEET WITH ECOLOGY AND FINALIZE DELIVERABLES**

Conduct meeting(s) with Ecology to review data analysis and presentation and adjust the final data presentation products to meet Ecology's needs. The final deliverables for these services include:

- This letter report summarizing the activities performed in Tasks 1 through 3.
- An electronic copy of the revised GIS data files developed under Task 1.
- Electronic copies of updated location maps, maps showing water table elevation contours and isoconcentration maps prepared under Task 2 and revised as part of Task 3.

### **DATA MANAGEMENT AND ANALYSIS**

Ecology provided seven data packages containing location, hydrologic and chemical analytical data. In addition, groundwater chemical analytical and hydrologic data collected in the Montesano area by Ecology was also downloaded from Ecology's EIM system. Only one of the seven data packages was received in an EIM format, and the data from the other six packages were manually entered into the database. Hydrologic data were first evaluated for seasonal variations in water table elevations. The database contains water table elevations for a variety of wells and soil probe locations from July 1998 to April 2008. A review of the water table elevations contained in the database indicated there were noticeable seasonal variations in water table elevations at the subject area, likely related to infiltration of rainwater from the surface. To broadly characterize seasonal variations for data presentation purposes, these variations were described as the "dry" season, which was characterized by a lowered water table, which typically occurred in the months between April and October, inclusive. The "wet" season was characterized by a rise in water table elevations, which typically occurred in the winter, over the months from November through March, inclusive. Water table elevation maps were then prepared for "dry" and "wet" seasons using the average water table elevations from surveyed monitoring wells. Although the database includes a large amount of water level information from soil probe explorations, it is our opinion that these data are not of sufficient quality to use in preparing representative water table elevation contours; therefore, only data from surveyed monitoring wells were used. Figures 3 and 4 present maps that used averages of all data at each location for dry and wet seasons, respectively.

Chemical analytical data for benzene and gasoline in groundwater were mapped by plotting the highest concentration for each compound of interest at each location from data collected between July 1998 and April 2008. These maps were prepared based on "dry" and "wet" seasons as described in the preceding paragraph. These concentrations were then gridded (using kriging) and contoured to develop isoconcentration maps specifically for gasoline and benzene. The software package Surfer 8 was used to create the concentration grids. Search parameters used in the kriging process included a major radius of 200 feet, a minor radius of 100 feet and an angle of 35 degrees. There were two sectors, and both sectors required useable data to be gridded. The angle represents the general directional influence of groundwater flow. These maps are presented as Figures 5 through 10.

### **DATA EVALUATION**

The maps illustrating the estimated groundwater surface contours were evaluated to assess whether any localized drainage features such as storm drains or sanitary sewer lines may be influencing groundwater flow. The chemical isoconcentration contour maps were compared among individual parcels in the subject area to provide a general assessment of whether the plumes from various individual locations in the subject area appeared to be mixing, or if they appeared to be separate plumes. Chemical isoconcentration contour maps for the "wet" and "dry" seasons were also compared to assess whether

there were seasonal variations of contaminant concentrations in groundwater. Finally, the gasoline and benzene concentrations in groundwater were visually compared on the maps to provide an assessment of relative ages of the groundwater plumes at the subject area. The three individual parcels that were evaluated using this approach are described in the following paragraphs.

### **WHITNEY'S INC./KEY BANK**

The Whitney's Inc./Key Bank property (Whitney's) is located on the south side of Pioneer Avenue, between 1<sup>st</sup> Street South and Main Street. Whitney's has had several underground storage tanks (USTs) abandoned in place at various locations, and there appears to have been releases of gasoline to the subsurface from these USTs. Gasoline-related contamination from Whitney's appears to have migrated to the southeast.

### **TONY'S SHORT STOP**

The Tony's Short Stop property (Tony's) is located on the northeast corner of Main Street and Wynoochee Avenue. Gasoline appears to have been released to the subsurface at Tony's from piping and USTs. The original USTs and piping at Tony's have been removed and replaced.

### **BRUMFIELD-TWIDWELL**

The Brumfield-Twidwell property (Brumfield-Twidwell) is located at the southeast corner of Pioneer Avenue and Sylvia Street South. Several USTs and contaminated soil located at this facility have been removed, and a new building has been constructed at the location of the former Brumfield-Twidwell building.

## **DISCUSSION AND CONCLUSIONS**

### **GENERAL SITE HYDROGEOLOGY**

Water table elevations exhibit seasonal variations at the subject area. The "dry" season, which is characterized by a lowered water table, typically occurs in the months of April through October. The "wet" season is characterized by a rise in water table elevations during the winter, typically between the months of November through March. The regional groundwater gradient is generally to the southeast during both the "wet" and "dry" seasons. There is some evidence of localized effects to this regional groundwater gradient, likely as a result of preferential flow along utility corridors. This may be observed in both Figures 3 and 4 near Brumfield-Twidwell. The groundwater contours are distorted along the alignment of the storm drain along Sylvia Street South. Groundwater appears to be flowing away from the storm drain alignment to the north of Brumfield-Twidwell and flowing into the storm drains alignment to the south of Brumfield-Twidwell. It is likely that the bedding material or the storm drain itself is affecting groundwater flows as the subsurface storm drain crosses the water table.

Contaminant concentrations in groundwater also exhibit seasonal variations. The concentrations of both gasoline and benzene are much lower during the "wet" season than those observed during the "dry" season. There are several possibilities for these lower chemical concentrations in groundwater. Some of these include simple dilution as a result of rainfall infiltrating into the shallow aquifer at the subject area, or a result of accelerated biological degradation of gasoline and benzene due to the infiltration of oxygenated rainwater into the shallow aquifer.

### **WHITNEY'S INC./KEY BANK**

Benzene concentrations are relatively low across Whitney's, which is common for plumes that have been present for relatively long periods of time. Benzene typically degrades more rapidly in the environment when compared to gasoline. The relative concentrations of benzene and gasoline at Whitney's as shown by the concentration contours for gasoline and benzene in groundwater, suggest that the plume is a result of an older release. The plume from Whitney's appears to extend well to the southeast, and it likely has co-mingled with the plume that originates at Tony's Short Stop.

### **TONY'S SHORT STOP**

Benzene concentrations in groundwater at Tony's Short Stop are generally much higher than those observed at Whitney's, but the gasoline concentrations are generally similar at both Whitney's and Tony's. These higher benzene concentrations have been viewed as an indication of a more recent release, as it is assumed the benzene has not had time to degrade, as it would have in an older release. It is not apparent from this data presentation if the portion of the plume that crosses Wynoochee Avenue is solely related to the release from Tony's Short Stop, or if it represents the co-mingling of the plumes from Tony's Short Stop, and those that were a part of any potential releases at Montesano Farm and Garden.

### **BRUMFIELD-TWIDWELL**

Benzene concentrations are relatively low across Brumfield-Twidwell, which is common for plumes that have been present for relatively long periods of time. Benzene typically degrades more rapidly in the environment when compared to gasoline. The relative concentrations of benzene and gasoline at Brumfield-Twidwell as shown by the concentration contours for gasoline and benzene in groundwater, suggest that the plume is a result of an older release. Potential contaminant flow to the west likely is limited by the presence of the storm drain on Sylvia Street South acting as a hydraulic barrier. However, this storm drain also may carry contamination from Brumfield-Twidwell in the storm drain flows. Storm drain flows at several locations in the subject area had detections of gasoline, and if the storm drains are located at or below the groundwater table, groundwater often infiltrates into the drains through joints and imperfections in the storm drain lines. The discharge point for the storm drain is not known at this time, but it is assumed that this storm drain ultimately flows to the Chehalis River.

## **RECOMMENDATIONS**

Any future data collection or evaluation efforts will need to be based on site-wide remedial goals. Based on our review of the data collected for the subject area, the existing data appears to over-represent the "dry" season. It is our understanding that Ecology performs quarterly groundwater monitoring of several wells in the downtown Montesano area. It is our opinion that it would be appropriate to shift the sampling schedule for these wells so that two sampling events are performed in the "dry" season, and two sampling events are performed in the "wet" season.

The individual parcels in the subject area have all been the subjects of remedial actions, but apportioning the responsibility for site cleanup will be challenging, particularly for the area along Wynoochee Avenue between Tony's Short Stop and Montesano Farm and Garden. Additional analysis by the involved parties at these individual parcels may provide additional information that will allow the identification of the source(s) of the contamination observed in this area.

## LIMITATIONS

We have prepared this letter for the exclusive use of the Washington State Department of Ecology and their authorized agents for their regional groundwater contamination evaluation in and around the City of Montesano, Washington. Our letter, findings and conclusions are not applicable to other sites.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of environmental explorations and evaluations in this area at the time this letter was prepared. No warranty or other conditions, express or implied, should be understood.

Attachment A, titled "Report Limitations and Guidelines for Use," provides additional information pertaining to use of this letter.

## REFERENCES

Associated Environmental Group, LLC, "Remedial Investigation Report, Brumfield Twidwell/Kolb Property, 301 East Pioneer Avenue, Montesano, WA 98563," May 5, 2006.

Associated Environmental Group, LLC, "Second Quarter Groundwater Monitoring/Sampling Event, Former Bumfield-Twidwell [sic] Site, 301 East Pioneer Avenue, Montesano, Washington 98563," September 18, 2006.

Associated Environmental Group, LLC, "Third Quarter Groundwater Monitoring/Sampling Event, January 2007, Former Brumfield-Twidwell Site, 301 East Pioneer Avenue, Montesano, WA 98563," January 29, 2007.

Associated Environmental Group, LLC, "Groundwater Monitoring/Sampling Event, July 2007, Tony's Short Stop, 326 Main Street, Montesano, WA 98563," August 6, 2007.

Associated Environmental Group, LLC, "Supplemental Remedial Investigation, Tony's Short Stop, 326 Main Street, Montesano, WA 98563," December 6, 2007.

Entrix, Inc., "Montesano Farm & Home, Modified Phase II Report," January 20, 2006.

GeoEngineers, Inc. "Groundwater Investigation, Downtown Montesano, Montesano, Washington," File No. 0504-024-00, August 5, 2005.

GeoEngineers, Inc. "Additional Groundwater Investigation, Downtown Montesano, Montesano, Washington," File No. 0504-024-01, August 15, 2006. Revised September 11, 2006.

GeoEngineers, Inc. "Report Addendum, Additional Groundwater Investigation, Downtown Montesano, Montesano, Washington," File No. 0504-024-01, September 12, 2006.

GeoEngineers, Inc. "Final White Paper, Leaking Underground Storage Tanks, Montesano, Washington," File No. 0504-038-00, August 30, 2007.

Hart Crowser, "Remedial Investigation and Preliminary Cleanup, Pedersen Property, Montesano, Washington," Project No. 17330-03, report on CD-ROM, June 28, 2007.

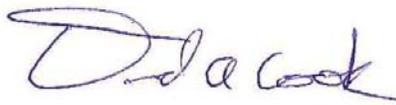
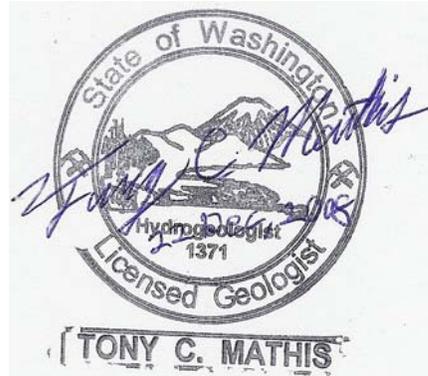
We appreciate the opportunity to assist you with this project. If you have any questions or concerns about the project status report or invoice, please call.

Sincerely,

GeoEngineers, Inc.



Tony C. Mathis, PE, LG, LHG  
Project Manager



David A. Cook, LG, RBP  
Principal

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Disclaimer: Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

- Enclosures:
- Figure 1. Vicinity Map
  - Figure 2. Subject Area Map
  - Figure 3. Water Elevations – Dry Season (April through October)
  - Figure 4. Water Elevations – Wet Season (November through March)
  - Figure 5. Gasoline – Dry Season (April through October)
  - Figure 6. Gasoline – Wet Season (November through March)
  - Figure 7. Benzene – Dry Season (April through October)
  - Figure 8. Benzene – Wet Season (November through March)
  - Figure 9. Gasoline – Dry Season 2007 (April through October)
  - Figure 10. Combined Map – Dry Season (April through October)
  - Attachment A – Report Limitations and Guidelines for Use
  - CD – Data Files and Images