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**Waterbury Library / Municipal Complex**  
**28 North Main Street**  
**Waterbury, Vermont**  
KAS Project #505140338

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**PHASE II ENVIRONMENTAL SITE ASSESSMENT**

June 26, 2014

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*Prepared for:*

Town of Waterbury  
51 South Main Street  
Waterbury, VT 05676



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## Table of Contents

<b>1.0 EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>2.0 REPORT PREPARATION/CERTIFICATION .....</b>	<b>3</b>
<b>3.0 INTRODUCTION .....</b>	<b>4</b>
3.1 Objectives.....	4
<b>4.0 BACKGROUND.....</b>	<b>5</b>
<b>5.0 ENVIRONMENTAL CONDITIONS ASSESSMENT - SOILS .....</b>	<b>5</b>
5.1 Pre-Drilling Activities.....	6
5.2 Sampling of Subsurface Soils .....	6
5.3 Soil Sample Collection and Laboratory Analysis.....	6
5.4 Soil Contaminant Distribution Analysis.....	7
<b>6.0 SITE CONCEPTUAL MODEL.....</b>	<b>8</b>
6.1 Site Conditions .....	8
6.2 Potential Sources.....	8
6.3 Potential Receptors.....	8
6.3.1 Buildings in the Vicinity.....	8
6.3.2 Utility Corridors.....	9
6.3.3 Wetlands and Surface Water Bodies .....	9
6.3.4 Public Water Supplies .....	9
6.3.5 Site Users.....	9
<b>7.0 QUALITY ASSURANCE / QUALITY CONTROL.....</b>	<b>9</b>
<b>8.0 CONCLUSIONS.....</b>	<b>10</b>
<b>9.0 RECOMMENDATIONS .....</b>	<b>10</b>

## APPENDICES

### APPENDIX A - Maps

    Site Location Map

    Site Map

### APPENDIX B - Soil Boring Logs

### APPENDIX C – Soil Test Pits and Shovel Pit Logs

### APPENDIX D - Soil Sampling Data Summary

### APPENDIX E - Laboratory Analytical Reports

### APPENDIX F - KAS Resumes

## 1.0 EXECUTIVE SUMMARY

This report summarizes the results of a Phase II Environmental Site Assessment (ESA) at the 28 North Main Street property (Site) located in Waterbury, Vermont. A Site Map and Site Location Map are included in Appendix A. Investigative work was conducted for the Town of Waterbury, bona fide owner of the property, according to the Scope of Work identified in KAS' proposal to the Town dated April 25, 2014. The work is funded by a grant awarded to the Town by the Vermont Community Development Grant Program (reference Grant Agreement #DR-PG-2012-Waterbury-00013). This Phase II ESA was limited to the property boundaries of 28 North Main Street (Parcel #900-0030).

The subject parcel is the site of the existing Waterbury Library and has included in the past a portion of the community garden that extends off the property to the west. KAS understands that the planned future use of the property includes new development including renovation of the existing library building and additional building to house a new municipal complex that will include the library, municipal offices and historical society. Based on the currently existing and proposed future use of the property as municipal infrastructure, data obtained from this investigation will be compared to commercial / industrial occupancy standards.

The investigative work was proposed to address Recognized Environmental Conditions (RECs) identified in a Phase I Environmental Site Assessment Report<sup>1</sup> dated March 4, 2014. Specifically, this work has been completed to address the following REC: "Historic photographs indicate a barn was formerly attached to the west end of the house. Archeological shovel test pits located directly behind the library reportedly encountered deep fill deposits which contained sand and gravel, rocks, coal, coal ash, slate, macadam and brick fragments. Polycyclic aromatic hydrocarbons (PAHs) resulting from the combustion of coal are potential contaminants of concern often associated with this type of "urban fill". As such, Weston & Sampson identifies the urban fill as a Recognized Environmental Condition (REC) at the Site"

KAS' Phase II ESA work scope included the following:

- Environmental Conditions Assessment-Soils, including soil borings completed in coordination with a geotechnical investigation, test pits in coordination with a stormwater soils assessment, and shovel test pits;
- Preparation of a Phase II ESA report.

### ***Environmental Conditions Assessment – Soils***

A total of eight soil borings were advanced on the Site on June 2 and 3, 2014. The purpose of these borings was to assess the contaminant concentrations, if present, in shallow soils and to complete a geotechnical investigation (separate report). Soil borings were advanced to depths ranging from 16'4" to 57'7" below grade. Five test pits were advanced to a depth of approximately 7'0" below grade on June 4, 2014 for the purpose of assessing contaminant concentrations, if present, in shallow soils and to complete a soils investigation for stormwater treatment practices (STPs) (separate report). Six shovel test pits were advanced to a maximum depth of 12" below grade also on June 4, 2014 to assess contaminant concentrations, if present, in shallow soils. The locations of the soil borings and test pits were primarily determined based on the needs of the geotechnical and soil stormwater investigations. The shovel test pit locations were determined in order to ensure a relative distribution of test locations across the property and to target locations in which fill had been identified as part of a Phase I Archeological Investigation performed by Hartgen Archeological Associates.

Soil samples were screened in the field for the presence of Volatile Organic Contaminants (VOCs) using a MiniRae Lite photoionization detector (PID) equipped with a 10.6 eV bulb. The PID was calibrated using an isobutylene reference prior to its use on June 2, 3, and 4, 2014. Soils were screened for the presence of VOCs using the KAS Jar/Polyethylene Bag Headspace Screening Protocol. No PID readings above background were measured during drilling.

The soil profile throughout the site generally consisted of fine to medium silty sand to 5 feet below surface grade (bgs) over well graded medium to coarse sand to 10 feet bgs over sand and gravel to 20 feet bgs over

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<sup>1</sup>Weston & Sampson, Phase I Environmental Site Assessment Report, 28 North Main Street, Waterbury, VT, March 4, 2014.



silt to bedrock. Bedrock was encountered at depths ranging from 16'4" bsg to 57'7" bsg and groundwater was generally 16-18' feet bsg. No odors or stained soil were observed during the investigation.

Soil samples were collected from all soil borings (SB-1 to SB-8), test pits (TP-1 to TP-5) and shovel test pits (SP-A to SP-F). Of the 19 samples collected, six were selected for laboratory analysis for Polycyclic Aromatic Hydrocarbons (PAHs) and priority pollutant metals. Samples submitted for laboratory analysis included SB-3, SP-E, SP-F, SP-B, SP-C, and TP-1. Shallow soil samples were obtained from each of the locations (0-2 feet bsg except at SB-3 where the sample was obtained from 0-6 feet as fill appeared to extend to that depth).

Based on the results of the analyses, none of the samples contained concentrations of PAHs in excess of the commercial / industrial soil screening values (SSVs) with the exception of the sample collected at SP-B, which was only slightly over the SSVs.

Concentrations of arsenic above the SSVs were reported in each of the soil samples. However, these concentrations are within the normal background range for soils in Vermont, with the exception of the sample collected at SP-B, which was slightly elevated, and not believed to be indicative of anthropogenic contamination. The concentration of lead in the shallow soil obtained from SP-B exceeded the SSVs for a commercial / industrial Site.

In summary, no VOCs were detected in any samples at the site based on soil screening at the time of soil exploration. The only elevated concentration of PAHs or metals (lead and arsenic only) is in the vicinity of SP-B, an area in which fill had been identified in the archeological report and confirmed by observations while collecting that soil sample. The specific source of the PAHs and metals detected are unknown but are indicative of urban fill and may be attributed to past uses at the existing or surrounding properties. As only the sample from SP-B exhibited elevated concentrations and the other samples were spread out around the portion of the property that is proposed to be developed and were targeted in other areas with identified fill, this result may indicate that impacted soils are isolated in this vicinity of the site and are not widespread across the site.

### **Recommendations**

Based on the investigative work as well as the above-stated conclusions for the Site, KAS recommends that the Vermont Department of Environmental Conservation (VTDEC) be notified of the elevated concentration of lead and PAHs measures in the soils. KAS also recommends that corrective action be taken with regards to the soil contamination and offers the following two options:

- 1) Soils in the vicinity of the sample collected at SP-B should be excavated and properly disposed of off-site. The extent of visually identified fill should be removed. The quantity of material is unknown; however, based on the results of soils investigation from this investigation and the Hartgen Archeological Investigation, it is estimated that an area of 100 square feet is impacted. Assuming a depth of 12-inches, a total estimated soil volume would be 4 cubic yards. Confirmation soil sampling should be completed following excavation to ensure that residual elevated PAH or metal concentrations do not remain at the site.
- 2) As an alternative to excavation, a soil management plan could be developed to properly manage soils in this portion of the site while redevelopment takes place and the new site development plan modified to include a soil and / or asphalt cap in this vicinity. This approach would require that all personnel working in this area be educated on the presence of contamination and possibly trained on the proper handling of the soil including applicable health and safety certifications. It may also require notification to land records.



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## 2.0 REPORT PREPARATION/CERTIFICATION

This Phase II Environmental Site Assessment Report was prepared pursuant to ASTM 1903-11 by KAS, Inc. for the Town of Waterbury, Vermont. The report was prepared by Erik Sandblom, Professional Engineer (PE) and Environmental Professional (EP), and was reviewed by Jeremy Roberts, EP. This report accurately represents the findings of the Phase II Environmental Site Assessment to the best of our knowledge.

Prepared by: Erik C.F. Sandblom, P.E.

Reviewed By: Jeremy Roberts, EP

### 3.0 INTRODUCTION

This report summarizes the results of a Phase II Environmental Site Assessment (ESA) at the 28 North Main Street property (Site) located in Waterbury, Vermont. A Site Map and Site Location Map are included in Appendix A. The Phase II ESA was performed by KAS, Inc. (KAS) in accordance with the American Society of Testing and Materials (ASTM) Practice ASTM E 1903-11. KAS performed this Phase II ESA for the Town of Waterbury, herein referred to as Client. This work was conducted pursuant to the approved professional services agreement between KAS and Client dated May 12, 2014 and Amendment also dated May 12, 2014. Investigation work took place in June 2014.

The Phase II ESA work was funded by a Vermont Community Development Grant (reference Grant Agreement #DR-PG-2012-Waterbury-00013). This Phase II ESA has been performed to facilitate the expanded development of the property. The Town of Waterbury (bona fide property owner and document user) is conducting due diligence prior to construction of a proposed Municipal Complex that is to include renovation of the existing library building into municipal offices and building additions to house the Historical Society and the Waterbury Library. The only structure on the property is the existing library building which is a historical residence.

The investigative work was proposed to address various Recognized Environmental Conditions (RECs) identified at the Site during a Phase I Environmental Site Assessment.<sup>2</sup> The Phase II ESA was performed within the boundaries of the subject parcel (Parcel #900-030).

#### 3.1 Objectives

The objectives of this Phase II ESA are to:

Evaluate whether there has been a release of hazardous substances or petroleum products in connection with the identified RECs (ASTM E 1903-11 at §1.2.1); and,

Provide information relevant to identifying, defining and evaluating property conditions associated with target analytes that may pose risk to human health or the environment, or risk of bodily injury to persons on the property (ASTM E 1903-11 at §1.2.4).

The means by which these objectives were completed included the following:

Environmental Conditions Assessment-Soils, including soil borings completed in coordination with a geotechnical investigation, test pits in coordination with a stormwater soils assessment, and shovel test pits;

Preparation of a Phase II ESA report.

The Phase II ESA focused on identifying the nature and extent of "urban fill" upon the portion of the property that is proposed to be newly developed. Based on the results of the site characterization, the potential environmental routes of exposure which directly bear on the proposed property use are to be identified. Conclusions presented in this assessment are based on the premise that the stated redevelopment of the property is for commercial / industrial use.

A groundwater assessment was not included in this investigation because it was not requested and was not deemed to be a potential risk. Groundwater is relatively deep in the vicinity of the Site (16 – 18 feet below

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<sup>2</sup>Weston & Sampson, Phase I Environmental Site Assessment Report, 28 North Main Street, Waterbury, VT, March 4, 2014.



surface grade (ftbsg)) and all area residents are on public water. There are no known water supply wells in the area. Groundwater quality does not have a direct bearing on the redevelopment of this property.

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## 4.0 BACKGROUND

The property is comprised of 0.5 acre of land that is currently used as the Waterbury Library and Historical Museum. A portion of the property to the west had previously been used as community gardens which now extend onto land off site further to the west. One structure is present at the site which is the site of a historical residence. Future use of the property is to be developed into an expanded municipal complex to house the library, historical museum and municipal offices. The property coordinates are 44°20'23.28" north latitude and 72°45'30.96" west longitude (see Appendix A Site Location Map).

The property is the historic former home of Civil War surgeon Dr. Henry Janes. The house was constructed in 1890 and was bequeathed to the Town of Waterbury by Dr. Janes after his death in 1915. According to the Phase I ESA Report, a barn was formerly attached to the west end of the house. Archeological shovel test pits located directly behind the library reportedly encountered deep fill deposits which contained sand and gravel, rocks, coal, coal ash, slate, macadam and brick fragments. The shovel test pits were located in the previous location of the dairy barn and the fill was most likely associated with the infilling of the barn foundation and/or landscaping with nearby machinery after the structure was removed from the site sometime in the mid to late 20<sup>th</sup> century.<sup>3</sup>

The property is located in the northern portion of Village of Waterbury. The character of the area is a mix of residential and light commercial enterprises and recreational fields border the site to the north. The site sits on a terrace adjacent to the Winooski River floodplain. Portions of the 100-year flood elevation border the northern portion of the site. Groundwater is approximately 16-18 feet below surface grade (bsg) and flow direction beneath the property is most likely toward the west based on the surface topography, and the location of the Winooski River. The predicted flow direction of groundwater was not confirmed during this Phase II ESA.

Weston & Sampson, Inc. conducted a Phase I ESA at the subject property dated March 4, 2014. The Phase I ESA revealed one Recognized Environmental Conditions (RECs) as defined by ASTM E-1527-05:

Historic photographs indicate a barn was formerly attached to the west end of the house. Archeological shovel test pits located directly behind the library reportedly encountered deep fill deposits which contained sand and gravel, rocks, coal, coal ash, slate, macadam and brick fragments. Polycyclic aromatic hydrocarbons (PAHs) resulting from the combustion of coal are potential contaminants of concern often associated with this type of "urban fill". As such, Weston & Sampson identifies the urban fill as a Recognized Environmental Condition (REC) at the Site.

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## 5.0 ENVIRONMENTAL CONDITIONS ASSESSMENT - SOILS

A soils investigation was completed that consisted in the performance of eight soil borings (SBs), five back-hoe test pits (TPs) and six hand-shovel test pits (SPs) at the Site on June 2, 3, and 4, 2014. The purpose the soils investigation was to identify the nature and extent of urban fill soils based on the evidence provided in the Phase I ESA and the Hartgen Archeological Investigation.

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<sup>3</sup>Hartgen Archeological Associates, Inc., Phase I Archeological Investigation, 28 North Main Street, Waterbury, VT, January 2014



### 5.1 Pre-Drilling Activities

Prior to the initiation of subsurface activities at the Site, KAS pre-marked locations as required by DigSafe on May 28, 2014. DigSafe ticket number 2014-2207795 was obtained. The City of Waterbury was also contacted for clearance of locations related to municipal water and sewer lines.

### 5.2 Sampling of Subsurface Soils

On June 2 and 3, 2014, KAS advanced soil borings SB-1 through SB-8 on the Site. The borings were advanced as part of a geotechnical investigation being performed in coordination with the Phase II ESA (geotechnical report separate). The borings were advanced by T&K Drilling of Troy, New Hampshire under the supervision of a KAS scientist or engineer, using a truck-mounted hollow-stem auger drill rig. An engineer from Knight Consulting Engineers, Inc. was also on-site during advancement of the soil borings for the geotechnical assessment. Soil borings were advanced to depths ranging from 16'4" to 57'7" below grade, which also represents the depth range at which bedrock was encountered. Detailed Soil Boring logs are provided in Appendix B.

On June 4, 2014, five test pits, TP-1 through TP-5, were completed with the use of a backhoe, supplied and operated by the Town of Waterbury Water Department. The test pits were conducted at part of an investigation of soil conditions for the design of stormwater treatment practices (STPs) that was conducted in coordination with and concurrent to the Phase II ESA (stormwater soil report separate).

Also on June 4, 2014, KAS completed six shovel test pits, SP-A to SP-F, to a maximum depth of 12-inches bsg. The purpose of the SPs was to distribute shallow soil sample locations throughout the site to the west of the existing building and parking lot and to target areas identified in the Hartgen Investigation that were described as "fill". All SBs, TPs, and SPs are shown on the Site Map in Appendix A.

The soil profile throughout the site generally consisted of fine to medium silty sand to 5 feet below surface grade (bgs) over well graded medium to coarse sand to 10 feet bgs over sand and gravel to 20 feet bgs over silt to bedrock. Bedrock was encountered between 16'4" bsg to 57'7" bsg and groundwater was generally 16-18' feet bsg. No odors or stained soil were observed during the investigation. Fill material was identified in SB-3, SB-5, and SP-B, including a piece of coal in SB-3.

All soil samples were screened in the field for the presence of Volatile Organic Contaminants (VOCs) using a MiniRae Lite photoionization detector (PID) equipped with a 10.6 eV bulb. The PID was calibrated using an isobutylene reference prior to its use on each day on June 2, 3, and 4, 2014. Soils were screened for the presence of VOCs using the KAS Jar/Polyethylene Bag Headspace Screening Protocol. None of the soil samples contained elevated readings of VOCs as measured with the PID. No odors or stained soil were observed during the investigation.

### 5.3 Soil Sample Collection and Laboratory Analysis

From the soil samples that were collected from the soil borings, test pits, and shovel test pits, a total of six shallow samples were selected and submitted for laboratory analysis. The following samples were selected for laboratory analysis:

Sample ID	Depth	Reason for Analysis
SB-3	0.0 – 6.0 ft	Fill detected; coal piece encountered; in vicinity of Hartgen shovel pit #1 described as fill.
SP-B	0.0 – 1.0 ft	Fill detected; in vicinity of Hartgen shovel pit #34 described as fill.





SP-C	0.0 – 1.0 ft	In vicinity of Hartgen shovel pit #37 described as fill (shale).
SP-E	0.0 – 1.0 ft	In vicinity of Hartgen shovel pit #27 described as fill.
SP-F	0.0 – 1.0 ft	In vicinity of Hartgen shovel pit #25 described as fill (coal ash)
TP-1	0.5 – 1.0 ft	Complete soil sample distribution across west side of parcel.

Each of the soil samples were analyzed for the following test parameters:

- PAHs via EPA Method M8270d;
- 13 Priority Pollutant Metals (PP13) via EPA Method 6010/6020; and

The samples were placed in a cooler with ice for storage and transportation to Eastern Analytical, Inc (EAI). Chain of custody procedures were followed. Tabulated results for the June 2-4, 2014 sampling event are included in Appendix D. The laboratory analytical report is included in Appendix E.

**PAHs via EPA Method 8270D:** PAHs were reported above the laboratory detection limits in all samples. None of the samples exhibited PAH concentrations above the commercial / industrial soil screening values (SSVs) with the exception of the soil sample from SP-B which exhibited a concentration of Benzo(a)Pyrene of 0.22 mg/kg and the Industrial SSV is 0.21 mg/kg. Toxicity Equivalency Factors were used to calculate the concentrations of PAHs relative to Benzo(a)Pyrene, and no other concentrations were detected above industrial SSVs using this method of data interpretation.

**13 Priority Pollutant Metals:** Concentrations of metals were reported in each of the soil samples. Concentrations of total arsenic above the industrial SSVs were reported in each of the soil samples. However, these concentrations appear to be within the normal background range for Vermont soil except for SP-B. One concentration of lead in excess of the industrial SSV was noted in the shallow soil sample obtained from SB-B.

#### 5.4 Soil Contaminant Distribution Analysis

The specific source of the PAHs detected are unknown but are indicative of urban fill and may be attributed to past uses at the existing or surrounding properties. As only the sample from SP-B exhibited elevated concentrations and the other samples were spread out around the portion of the property that is proposed to be developed and were targeted in other areas with identified fill, this result indicates that impacted soils are isolated in the vicinity of SP-B and are not widespread across the site. All soil investigation locations on the western end of the property contained native soils with no fill detected so there is no reason to believe contamination exists in this area.

Concentrations of arsenic above the SSVs were reported in each of the soil samples. However, these concentrations are within the normal background range for soils in Vermont and not believed to be indicative of anthropogenic contamination. The concentration of lead in the shallow soil obtained from SB-B exceeded the SSVs for an industrial Site. There is no known existing source of lead on the property.

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## 6.0 SITE CONCEPTUAL MODEL

### 6.1 Site Conditions

The 28 North Main Street property is located in a predominantly urban residential / light commercial area in the northern part of the Village of Waterbury, Vermont. The character of the area is moderately developed with single family dwellings, multiple unit housing, offices and other light commercial uses. The site was reportedly historically operated as a farm and recent and ongoing community gardens are located on the west end of the property and off-property further west. Recreational fields are located north and west of the property. The general topography in the area is gentle to moderately sloped down to the north and west.

The subject property exists approximately 429 feet above current sea level. Based on the drilling results, bedrock is located 16 – 57 feet bsg at the site. No bedrock outcroppings were observed at the Site. According to the Bedrock Geologic Map of Vermont (Ratcliffe, et al, 2011), the site is located within the Ottauquechee Formation consisting of black carbonaceous phyllite or schist containing interbeds of massive quartzite commonly criss-crossed by veins of white quartz; quartzite is dark and carbonaceous, light gray, or white; also includes light green quartz-sericite-chlorite phyllite or schist and sericitic quartzite. Surficial soils are mapped as fluvial sands and gravels, which was confirmed in the soil borings and test pits. Lake bottom sediments comprise deeper surficial soils where bedrock extends in the deeper ranges.

The site is located within the 500 year flood zone for the Winooski River and the 100 year flood elevation is at 423 feet above sea level, near the northern property boundary.

Soil borings, test pits, and shovel test pits were placed throughout the property in locations that were accessible. Essentially, no contaminants in excess of the industrialSSVs were detected in the soil samples obtained except for arsenic in all samples and PAHs and lead only in SP-B. The contaminated soils on the property are covered with vegetation. The contamination is believed to encompass shallow soils within a limited area in the vicinity of sample SP-B. Based on the visual observations, testing results, and results of the Archeological Investigation, the extent of contaminated soil is expected to be limited to 12" in depth over a 100 square-foot area.

### 6.2 Potential Sources

The levels of PAHs evident in the soil samples obtained are indicative of urban soils and are likely due to historic property uses and or coal/wood burning and filling a former barn foundation. The arsenic concentrations in the soils are indicative of Vermont soils and no sources of contamination are believed to exist on the property. An exceedance of lead was also noted in the shallow soil sample obtained from soil boring SP-B. No known sources of metal contamination exist on the property but they could be due in part to the historic property use and/or fill soils brought onto the property.

### 6.3 Potential Receptors

#### 6.3.1 Buildings in the Vicinity

A proposed building to be constructed on the property does not come into contact with the area where contaminated soils have been measured. An asphalt driveway and parking and landscaping is proposed in this area. Residential buildings are located to the south of the site, more than 50 feet from the location of detected soil contamination. Given the separation distance and the nature and degree of contamination, existing and proposed buildings are not considered receptors at risk of impact from contaminated soils at this site.



### 6.3.2 Utility Corridors

All subsurface utility corridors are located below North Main Street or between the existing building and Main Street, which is several hundred feet to the east of where impacted soils were measured. As such, utility corridors are not expected to be at risk of impact.

### 6.3.3 Wetlands and Surface Water Bodies

No potential jurisdictional wetlands were observed in the immediate vicinity (Site and abutters) of the Site. The nearest surface water body is the Winooski river, located approximately 950 feet to the northwest. The surface water body are not believed to be impacted from contamination from the Site due to the immobile nature of the contaminants and the distance to the water body.

### 6.3.4 Public Water Supplies

The subject property and surrounding area is served by a municipal water system. The closest known water supply well is located approximately 1.5 miles up-gradient to the north according to the DEC's on line water supply well locator.<sup>4</sup>The supply well is not believed to be impacted from contamination from the Site due to the immobile nature of the contaminants and the distance from the well.

### 6.3.5 Site Users

The subject is currently used as a library and the future use of the property is planned to be an expanded municipal facility including library, historical society, and town offices. If the contamination remains unmanaged, users could be exposed to contaminant concentrations above regulatory standards in the shallow soils on the property.

Based on the results of this assessment it appears that the following sensitive receptors are impacted at this time: soil. The following potential sensitive receptors may be impacted: site users.

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## 7.0 QUALITY ASSURANCE / QUALITY CONTROL

### Field Methods

All field methods and sample collection and handling procedures complies with KAS applicable protocols for the work that was completed.

### Lab QA/QC Findings

It was documented that representative samples were collected in an appropriate manner and that all samples adhered to the laboratory sample acceptance policy. All test results meet all the requirements of NELAP and other applicable state certifications.

### HASP

A site specific Health and Safety Plan (HASP) was developed for the project and it was implemented and enforced during all site activities as a part of this investigation.

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<sup>4</sup> Vermont Agency of Natural Resources Private Well Locator

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## 8.0 CONCLUSIONS

KAS has completed a Phase II ESA in accordance with the Scope of Work identified in KAS' proposal to the Town of Waterbury dated April 25, 2014. The guidelines set forth in Phase II ESA are from ASTM E 1903-11 Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process. Based on the results of investigative work conducted during this Phase II ESA, KAS presents the following conclusions:

No VOCs were detected in any samples collected at the site based on soil screening at the time of soil exploration. The only elevated concentration of PAHs or metals (lead and arsenic only) is in the vicinity of SP-B, an area in which fill had been identified in the archeological report and confirmed by observations while collecting that soil sample. The specific source of the PAHs and metals detected are unknown but are indicative of urban fill and may be attributed to past uses at the existing or surrounding properties. As only the sample from SP-B exhibited elevated concentrations and the other samples were spread out around the portion of the property that is proposed to be developed and were targeted in other areas with identified fill, this result may indicate that impacted soils are isolated in this vicinity of the site and are not widespread across the site.

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## 9.0 RECOMMENDATIONS

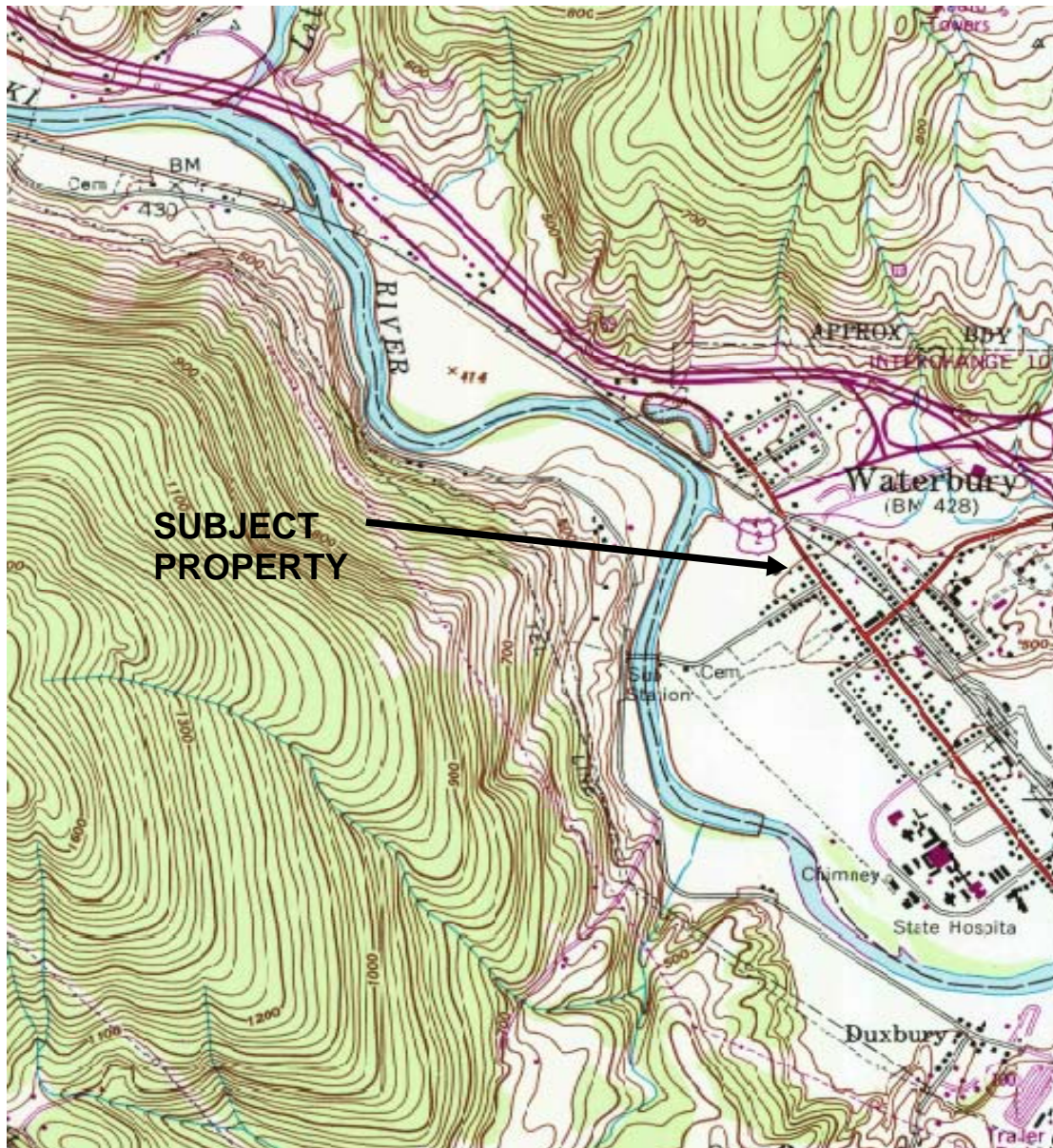
Based on the investigative work as well as the above-stated conclusions for the Site, KAS makes the following recommendations:

- 1) The VTDEC should be notified of the presence of elevated levels of PAHs and metals in the vicinity of SP-B at the site.
- 2) Personnel working in this area should be educated on the presence of contamination.
- 3) Corrective Action should be taken to respond to the soil contamination identified at SP-B. The following options are presented:
  - a) Soils in the vicinity of the sample collected at SP-B should be excavated and properly disposed of off-site. The extent of visually identified fill should be removed. The quantity of material is unknown; however, based on the results of soils investigation from this investigation and the Hartgen Archeological Investigation, it is estimated that an area of 100 square feet is impacted. Assuming a depth of 12-inches, a total estimated soil volume would be 4 cubic yards. Confirmation soil sampling should be completed following excavation to ensure that residual elevated PAH or metal concentrations do not remain at the site.
  - b) As an alternative to excavation, a soil management plan could be developed to properly manage soils in this portion of the site while redevelopment takes place and the new site development plan modified to include a soil and / or asphalt cap in this vicinity. This approach would require that all personnel working in this area be educated on the presence of contamination and possibly trained on the proper handling of the soil including applicable health and safety certifications. It may also require notification to land records



## **APPENDIXA - Maps**

- 1) Site Location Map**
- 2) Site Map**



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KAS Job Number 505140338  
 Source: USGS 7.5 x 7.5 Minute Quadrangle - Waterbury, VT 1980



**Waterbury Library / Municipal Complex**  
 28 North Main Street, Waterbury, Vermont

Site Location Map

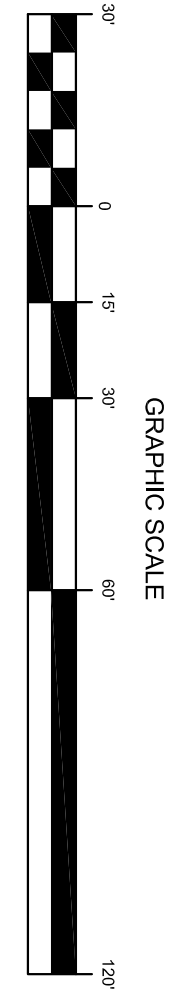
Date: 06/23/14 | Drawing No. 0 | Scale: 1:24,000 | By: ES



NOTE: BASEMAP PROVIDED BY GRENER ENGINEERING, P.C., SOIL BORING, TEST PIT, AND SHOVEL PIT LOCATIONS ADDED BY K&S, INC.

LEGEND

- BC SOIL BORING
- ES TEST PIT
- SHOVEL TEST PIT



SOIL BORING, TEST PIT, AND SHOVEL PIT LOCATION MAP

REVISIONS	BY

Environmental Science & Engineering  
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 802 383 0490 f



**WATERBURY LIBRARY / MUNICIPAL COMPLEX PROJECT**  
**28 NORTH MAIN STREET WATERBURY, VERMONT**

FORM	BC
ORIGINATOR	ES
DATE	6/16/14
SCALE	1"=30'
DWG NO.	505140338
SHEET	

SP-1



## **APPENDIX B**

### **SOIL BORING LOGS**



# SOIL BORING LOG

Boring No: SB-1



**28 North Main Street**  
Waterbury, Vermont

KAS Project #: 505140338	Date Installed: 6/2/2014	
Drilled by: T&K Drilling	Drilling Method: Hollow Stem Auger	
Driller: Sean and Kevin	Boring Diameter.: 4.25"	
Supervised by: Toni Poquette	Development Method: N/A	
Logged by: Toni Poquette	Screened Length: N/A	

Letter Symbol  
Graphic Symbol

Grade = 0	Well Construction	Pen/Rec (")	Interval (')	Soil Characteristics	Letter Symbol	Graphic Symbol
		Blow Count	PID (ppm)			
1.0		24/18	0-2	<b>Silty Sand (SM)</b>	SM	
2.0		1,3,2,3	0.8	dry, brown, well graded, sand / gravel / organic in top 2"		
3.0		24/16	2-4	<b>Well Graded Sand with Silt (SW-SM)</b>	SW-SM	
4.0		3,4,4,4	0.1	dry, brown		
5.0		24/15	4-6	<b>Poorly Graded Sand w/Gravel (SP)</b>	SP	
6.0		2,2,2,4	0.7	dry, brown & black		
7.0		24/4	6-8	<b>Poorly Graded Gravel w/Sand (GP)</b>	GP	
8.0		5,3,2,3	.8	dry, brown		
9.0		24/3	8-10	<b>Silty Sand w/ Gravel (SM)</b>	SM	
10.0		6,5,5,3	0.6	dry, brown, quartz stone at bottom of spoon		
11.0		24/12	10-12	<b>Silt with Well Graded Sand &amp; Gravel (ML)</b>	ML	
12.0		16,4,3,4	0.1	dry/moist, brown and gray		
13.0						
14.0						
15.0						
16.0	▼ ~16' 6/2/2014	24/13	15-17	<b>Silt with some Sand (ML)</b>	ML	
17.0		9,4,5,5	0.5	wet, gray		
18.0						
19.0						
20.0						
21.0		24/15	20-22	<b>Silt and Clayey Silt (ML)</b>	ML	
22.0		2,4,4,4	0.6	wet, gray		
23.0						
24.0						
25.0						
26.0		24/17	25-27	<b>Well Graded Sand and Silt (SW-SM)</b>	SW-SM	
27.0		-, -, 2,3	0.5	wet, dark gray, dropped fist 12" by weight of hammer	SW-SM	
28.0				End Exploration at 27'		
29.0						
30.0						
31.0						
32.0						
33.0						
34.0						
35.0						
36.0						
37.0						
38.0						

Legend

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li> Road Box with Bolt Down Cover, Set in Cement.</li> <li> Existing Surface.</li> <li> Bentonite Seal Placed in Annulus.</li> <li> Grade #1 Silica Sand Pack Placed in Annulus.</li> <li> Drill Cuttings Placed in Annulus.</li> <li>NA Not Applicable</li> </ul> | <ul style="list-style-type: none"> <li> Locking Plug.</li> <li> 2" ID, Schedule 40 PVC Riser.</li> <li> 2" ID, Schedule 40 PVC, 0.010"-Slotted Well Screen</li> <li> Plug Point</li> <li> Approximate Water Level During Drilling</li> <li> Static Water Level</li> </ul> |
|--|---|

# SOIL BORING LOG

Boring No: SB-2



28 North Main Street  
Waterbury, Vermont

KAS Project #: 505140338	Date Installed: 6/2/2014	
Drilled by: T&K Drilling	Drilling Method: Hollow Stem Auger	
Driller: Sean and Kevin	Boring Diameter.: 4.25"	
Supervised by: Toni Poquette	Development Method: N/A	
Logged by: Toni Poquette	Screened Length: N/A	

Letter Symbol  
Graphic Symbol

Grade = 0	Well Construction	Pen/Rec (")	Interval (')	Soil Characteristics	Letter Symbol	Graphic Symbol
		Blow Count	PID (ppm)			
1.0		24/14	0-2	<b>Well Graded Sand w/ Gravel (SW)</b>	SW	
2.0		4,4,3,4	0.1	dry, brown		
3.0		24/7	2-4	<b>Well Graded Silty Sand (SM)</b>	SM	
4.0		4,3,3,4	0.3	dry, brown, little gravel		
5.0		24/20	4-6	<b>Well Graded Sand w/ Silt (SW-SM)</b>	SW-SM	
6.0		3,2,3,3	0.2	dry, brown		
7.0		24/20	6-8	<b>Well Graded Sand (SW)</b>	SW	
8.0		3,2,1,3	0.4	dry, brown		
9.0		24/18	8-10	<b>Poor Graded Sand (SP)</b>	SP	
10.0		3,2,3,4	0.2	dry, brown		
11.0		24/22	10-12	<b>Well Graded Sand (SW)</b>	SW	
12.0		2,2,3,10	0.4	dry, brown		
13.0						
14.0						
15.0						
16.0		24/14	15-17	<b>Poor Graded Gravel w/ Sand (GP)</b>	GP	
17.0		15,20,23,29	0.2	dry, brown, coarse sand / fine gravel		
18.0						
19.0						
20.0						
21.0		24/15	20-22	<b>Silt and Clayey Silt (ML)</b>	ML	
22.0		3,4,7,8	0.2	moist/wet. Brown to gray / transition		
23.0						
24.0						
25.0						
26.0		24/16	25-27	<b>Silt and Clayey Silt (ML)</b>	ML	
27.0		2,2,4,5	0.3	wet, gray		
28.0				End Exploration at 27'		
29.0						
30.0						
31.0						
32.0						
33.0						
34.0						
35.0						
36.0						
37.0						
38.0						

▼ ~20'  
6/2/14

Legend

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li> Road Box with Bolt Down Cover, Set in Cement.</li> <li> Existing Surface.</li> <li> Bentonite Seal Placed in Annulus.</li> <li> Grade #1 Silica Sand Pack Placed in Annulus.</li> <li> Drill Cuttings Placed in Annulus.</li> <li>NA Not Applicable</li> </ul> | <ul style="list-style-type: none"> <li> Locking Plug.</li> <li> 2" ID, Schedule 40 PVC Riser.</li> <li> 2" ID, Schedule 40 PVC, 0.010"-Slotted Well Screen</li> <li> Plug Point</li> <li> Approximate Water Level During Drilling</li> <li> Static Water Level</li> </ul> |
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# SOIL BORING LOG

Boring No: SB-3



**28 North Main Street**  
Waterbury, Vermont

KAS Project #: 505140338	Date Installed: 6/3/2014	
Drilled by: T&K Drilling	Drilling Method: Hollow Stem Auger	
Driller: Sean and Kevin	Boring Diameter.: 4.25"	
Supervised by: Erik Sandblom	Development Method: N/A	
Logged by: Erik Sandblom	Screened Length: N/A	

Letter Symbol  
Graphic Symbol

Grade = 0	Well Construction	Pen/Rec (")	Interval (')	Soil Characteristics	Letter Symbol	Graphic Symbol
		Blow Count	PID (ppm)			
1.0		24/15	0-2	<b>Silty Sand (SM)</b>	SM	
2.0		2,3,4,5	0.1	dry, dark brown / black, topsoil		
3.0		24/0	2-4	<b>No Recovery</b>		
4.0		3,3,2,2				
5.0		24/12	4-6	<b>Poor Graded Gravel w/ Sand (GP)</b>	GP	
6.0		17,9,17,12	0.1	dry, brown / gray / reddish; apparent fill		
7.0		24/2	6-8	<b>Silty Sand w/ Gravel (SM)</b>	SM	
8.0		6,3,2,2	0.4	dry, brown, with some organic material		
9.0		24/?	8-10	<b>Well Graded Sand w/ Silt (SW-SM)</b>	SW-SM	
10.0		5,8,13,13	0.1	dry, brown		
11.0		24/?	10-12	<b>Silty Sand and Gravel (SM-GM)</b>	SM-GM	
12.0		12,12,11,12	0.3	dry, brown/rust		
13.0						
14.0						
15.0						
16.0						
17.0						
18.0						
18.5'	▽ 6/4/14					
19.0	-19'					
20.0	6/3/14	24/14	20-22	<b>Silt (ML)</b>	ML	
21.0		12,14,11,7	0.2	wet, brown - transition fine gravel/coarse sand to silt		
22.0		24/?	25-27	<b>Silt (ML)</b>	ML	
23.0		3,5,4,4	0.1	wet, gray		
24.0						
25.0						
26.0						
27.0						
28.0						
29.0						
30.0		24/?	30-32	<b>Silt (ML)</b>	ML	
31.0		3,6,5,5	0.1	wet, gray - 2" piece of coal in auger		
32.0		24/?	35-37	<b>Silt (ML)</b>	ML	
33.0		5,5,7,14	0.1	wet, gray		
34.0						
35.0						
36.0						
37.0						
38.0						
39.0						
40.0		24/?	40-42	<b>Silt (ML)</b>	ML	
41.0		4,5,5,6	0.1	wet, gray		
42.0		24/?	45-47	<b>Silt (ML)</b>	ML	
43.0		-5,5,7	0.2	wet, gray		
44.0						
45.0						
46.0						
47.0						
48.0						
49.0						
50.0		24/?	50-52	<b>Silt (ML)</b>	ML	
51.0		-5,7,9	0.1	wet, gray		
52.0		24/?	55-57	<b>Silt w/ Coarse Sand and Gravel (ML)</b>	ML	
53.0		-5,7,9	0.1	wet, gray		
54.0						
55.0						
56.0						
57.0						
58.0				End of Exploration at Refusal 57'7"		
59.0						
60.0						
61.0						
62.0						

Legend

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li> Road Box with Bolt Down Cover, Set in Cement.</li> <li> Existing Surface.</li> <li> Bentonite Seal Placed in Annulus.</li> <li> Grade #1 Silica Sand Pack Placed in Annulus.</li> <li> Drill Cuttings Placed in Annulus.</li> <li>NA Not Applicable</li> </ul> | <ul style="list-style-type: none"> <li> Locking Plug.</li> <li> 2" ID, Schedule 40 PVC Riser.</li> <li> 2" ID, Schedule 40 PVC, 0.010"-Slotted Well Screen</li> <li> Plug Point</li> <li> Approximate Water Level During Drilling</li> <li> Static Water Level</li> </ul> |
|--|---|

# SOIL BORING LOG

Boring No: SB-4



28 North Main Street  
Waterbury, Vermont

KAS Project #: 505140338	Date Installed: 6/3/2014	
Drilled by: T&K Drilling	Drilling Method: Hollow Stem Auger	
Driller: Sean and Kevin	Boring Diameter.: 4.25"	
Supervised by: Erik Sandblom	Development Method: N/A	
Logged by: Erik Sandblom	Screened Length: N/A	

Letter Symbol  
Graphic Symbol

Grade = 0	Well Construction	Pen/Rec (")	Interval (')	Soil Characteristics	Letter Symbol	Graphic Symbol
		Blow Count	PID (ppm)			
1.0		24/14	0-2	<b>Silty Sand (SM)</b>	SM	
2.0		6,7,11,20	0.2	dry, dark gray / brown (stone stuck in shoe)		
3.0		24/14	2-4	<b>Silt w/ Very Fine Sand (ML)</b>	ML	
4.0		27,5,6,8	0.9	dry, brown		
5.0		24/18	4-6	<b>Silty Sand (SM)</b>	SM	
6.0		3,3,3,5	0.2	dry, brown, very fine poor graded sand		
7.0		24/20	6-8	<b>Well Graded Sand w/ Silt (SW-SM)</b>	SW-SM	
8.0		4,2,3,4	0.2	dry, brown / black / light brown / white		
9.0		24/18	8-10	<b>Well Graded Sand (SW)</b>	SW	
10.0		4,3,3,4	0.2	dry, brown / black / light brown / white		
11.0		24/16	10-12	<b>Sand and Gravel w/ Silt (SM-GM)</b>	SM-GM	
12.0		3,6,14,17	0.3	dry, brown / orange / white / black	GM	
13.0						
14.0						
15.0						
16.0		24/14	15-17	<b>Sand and Gravel w/ Silt (SM-GM)</b>	SM-GM	
17.0		12,28,33,35	0.3	dry, orange / black / brown / white	GM	
18.0						
19.0						
20.0						
21.0		24/?	20-22	<b>Silt and Sandy Silt (ML)</b>	ML	
22.0		4,9,7,6	0.2	moist/wet. Brown to gray / transition		
23.0						
24.0						
25.0						
26.0		24/?	25-27	<b>Silt and Clayey Silt (ML)</b>	ML	
27.0		4,6,8,6	0.1	wet, gray		
28.0				End Exploration at 27'		
29.0						
30.0						
31.0						
32.0						
33.0						
34.0						
35.0						
36.0						
37.0						
38.0						

~20'  
6/3/14

Legend

<ul style="list-style-type: none"> <li> Road Box with Bolt Down Cover, Set in Cement.</li> <li> Existing Surface.</li> <li> Bentonite Seal Placed in Annulus.</li> <li> Grade #1 Silica Sand Pack Placed in Annulus.</li> <li> Drill Cuttings Placed in Annulus.</li> <li>NA Not Applicable</li> </ul>	<ul style="list-style-type: none"> <li> Locking Plug.</li> <li> 2" ID, Schedule 40 PVC Riser.</li> <li> 2" ID, Schedule 40 PVC, 0.010"-Slotted Well Screen</li> <li> Plug Point</li> <li> Approximate Water Level During Drilling</li> <li> Static Water Level</li> </ul>
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# SOIL BORING LOG

Boring No: SB-5



**28 North Main Street**  
Waterbury, Vermont

KAS Project #: 505140338	Date Installed: 6/2/2014	
Drilled by: T&K Drilling	Drilling Method: Hollow Stem Auger	
Driller: Sean and Kevin	Boring Diameter.: 4.25"	
Supervised by: Toni Poquette	Development Method: N/A	
Logged by: Toni Poquette	Screened Length: N/A	

Letter Symbol  
Graphic Symbol

Grade = 0	Well Construction	Pen/Rec (")	Interval (')	Soil Characteristics	Letter Symbol	Graphic Symbol
		Blow Count	PID (ppm)			
1.0		24/5	0-2	<b>Well Graded Sand w/ Gravel (SW)</b>	SW	
2.0		3,5,5,5	0.9	dry, brown / organics in top layer		
3.0		24/6	2-4	<b>Well Graded Gravel w/ Sand (GW)</b>	GW	
4.0		7,8,7,9	0.9	dry, brown / black, med/coarse sand and fine gravel - fill		
5.0		24/16	4-6	<b>Well Graded Gravel w/ Sand (GW)</b>	GW	
6.0		7,8,9,13	0.8	dry, brown to light brown		
7.0		24/18	6-8	<b>Well Graded Gravel w/ Sand (GW)</b>	GW	
8.0		13,12,13,20	0.9	dry, brown & white		
9.0		24/18	8-10	<b>Well Graded Gravel w/ Sand (GW)</b>	GW	
10.0		12,13,20,19	0.8	dry, brown, light brown, and orange		
11.0		24/22	10-12	<b>Well Graded Gravel w/ Sand (GW)</b>	GW	
12.0		2,2,3,10	0.4	dry, brown & white, rounded coarse gravel on auger		
13.0						
14.0						
15.0						
16.0		24/18	15-17	<b>Silty Sand (SM)</b>	SM	
17.0		5,7,7,7	0.8	wet gray with some brown		
18.0						
19.0						
20.0						
21.0		4/4	20 - 20.4	<b>Silty Sand w/ Gravel (SM)</b>	SM	
22.0		42	0.6	wet gray/green rock		
23.0				End Exploration at Refusal 20.4'		
24.0						
25.0						
26.0						
27.0						
28.0						
29.0						
30.0						
31.0						
32.0						
33.0						
34.0						
35.0						
36.0						
37.0						
38.0						

▼ ~15'  
6/2/14

Legend

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li> Road Box with Bolt Down Cover, Set in Cement.</li> <li> Existing Surface.</li> <li> Bentonite Seal Placed in Annulus.</li> <li> Grade #1 Silica Sand Pack Placed in Annulus.</li> <li> Drill Cuttings Placed in Annulus.</li> <li>NA Not Applicable</li> </ul> | <ul style="list-style-type: none"> <li> Locking Plug.</li> <li> 2" ID, Schedule 40 PVC Riser.</li> <li> 2" ID, Schedule 40 PVC, 0.010" Slotted Well Screen</li> <li> Plug Point</li> <li> Approximate Water Level During Drilling</li> <li> Static Water Level</li> </ul> |
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# SOIL BORING LOG

Boring No: SB-6



**28 North Main Street**  
Waterbury, Vermont

KAS Project #: 505140338	Date Installed: 6/2/2014 & 6/3/2014	
Drilled by: T&K Drilling	Drilling Method: Hollow Stem Auger	
Driller: Sean and Kevin	Boring Diameter.: 4.25"	
Supervised by: TP & ES	Development Method: N/A	
Logged by: TP & ES	Screened Length: N/A	

Letter Symbol  
Graphic Symbol

	Well Construction	Pen/Rec (")	Interval (')	Soil Characteristics	Letter Symbol	Graphic Symbol
Grade = 0		Blow Count	PID (ppm)			
1.0		24/20	0-2	<b>Well Graded Silty Sand (SM)</b>	SM	
2.0		2,3,3,3	1.5	dry, brown & dark brown		
3.0		24/20	2-4	<b>Well Graded Sand w/ Silt (SW-SM)</b>	SW-SM	
4.0		3,2,2,2	0.8	dry, brown, some fine gravel		
5.0		24/18	4-6	<b>Well Graded Sand (SW)</b>	SW	
6.0		3,2,2,4	0.4	dry, brown		
7.0		24/18	6-8	<b>Poor Graded Sand and Gravel (SP-GP)</b>	SP-GP	
8.0		5,11,9,9	0.3	dry, multi-brown, orange, top 8" more sand, rest gravel		
9.0		24/18	8-10	<b>Well Graded Gravel w/ Sand</b>	GW	
10.0		3,2,3,4	0.2	dry, brown, white, and orange, sand med to coarse		
11.0		24/18	10-12	<b>Well Graded Gravel w/ Sand</b>	GW	
12.0		9,18,18,24	0.4	dry, brown, orange, dark brown, light gray		
13.0						
14.0						
15.0						
16.0		24/14	15-17	<b>Well Graded Silty Sand w/ Gravel (SM)</b>	SM	
17.0	▼ ~16' 6/3/14	18,13,21,21	0.3	moist to wet, brown, black, white, and gray, silty bottom		
18.0						
19.0						
20.0						
21.0		24/15	20-22	<b>Silt (ML)</b>	ML	
22.0		11,13,11,20	0.1	wet dark gray coarse silt		
23.0						
24.0				End Exploration at Refusal 23'8"		
25.0						
26.0						
27.0						
28.0						
29.0						
30.0						
31.0						
32.0						
33.0						
34.0						
35.0						
36.0						
37.0						
38.0						

Legend

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li> Road Box with Bolt Down Cover, Set in Cement.</li> <li> Existing Surface.</li> <li> Bentonite Seal Placed in Annulus.</li> <li> Grade #1 Silica Sand Pack Placed in Annulus.</li> <li> Drill Cuttings Placed in Annulus.</li> <li>NA Not Applicable</li> </ul> | <ul style="list-style-type: none"> <li> Locking Plug.</li> <li> 2" ID, Schedule 40 PVC Riser.</li> <li> 2" ID, Schedule 40 PVC, 0.010" Slotted Well Screen</li> <li> Plug Point</li> <li> Approximate Water Level During Drilling</li> <li> Static Water Level</li> </ul> |
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# SOIL BORING LOG

Boring No: SB-7



**28 North Main Street**  
Waterbury, Vermont

KAS Project #: 505140338	Date Installed: 6/3/2014	
Drilled by: T&K Drilling	Drilling Method: Hollow Stem Auger	
Driller: Sean and Kevin	Boring Diameter.: 4.25"	
Supervised by: Erik Sandblom	Development Method: N/A	
Logged by: Erik Sandblom	Screened Length: N/A	

Letter Symbol  
Graphic Symbol

Grade = 0	Well Construction	Pen/Rec (")	Interval (')	Soil Characteristics	Letter Symbol	Graphic Symbol
		Blow Count	PID (ppm)			
1.0		24/17	0-2	<b>Very Fine Sandy Silt (ML)</b>	ML	
2.0		3,3,3,3	0.2	dry, brown		
3.0		24/?	2-4	<b>Sandy Silt (ML)</b>	ML	
4.0		3,3,2,3	0.4	dry, brown		
5.0		24/?	4-6	<b>Well Graded Silty Sand (SM)</b>	SM	
6.0		2,3,2,2	0.2	dry, brown / light brown		
7.0		24/18	6-8	<b>Well Graded Sand w/ Silt (SW-SM)</b>	SW-SM	
8.0		2,3,2,4	0.1	dry, brown w/balck and light brown		
9.0		24/18	8-10	<b>Well Graded Sand w/ Silt (SW-SM)</b>	SW-SM	
10.0		3,3,2,2	0.2	dry, brown w/balck and light brown		
11.0		24/15	10-12	<b>Well Graded Sand w/ Gravel (SW)</b>	SW	
12.0		4,5,6,8	0.2	dry, variable brown, white, black colors		
13.0						
14.0						
15.0		24/?	15-17	<b>Well Graded Sand w/ Gravel (SW)</b>	SW	
16.0		15,25,40,43	0.2	dry, brown, coarse sand / fine gravel		
17.0						
18.0						
19.0						
20.0		24/?	20-22	<b>Poor Graded Gravel w/ Sand (GP)</b>	GP	
22.0	12,15,7,17	0.2	wet, brown			
24.0	24/?	25-27	<b>Silt (ML)</b>	ML		
26.0	8,7,9,8	0.1	wet, gray			
28.0						
30.0	24/?	30-32	<b>Silt (ML)</b>	ML		
32.0	-,3,5,5	0.2	wet, gray			
34.0	24/?	35-37	<b>Silt (ML)</b>	ML		
36.0	4,5,5,7	0.1	wet, gray			
38.0						
40.0	24/?	40-42	<b>Silt (ML)</b>	ML		
42.0	13,14,5,8	0.2	wet, gray			
44.0	24/?	45-47	<b>Silt w/ Clay (ML)</b>	ML		
46.0	-,2,4,6	0.2	wet, gray			
48.0						
50.0	24/?	50-50'2"	<b>Silty Sand (SM)</b>	SM		
52.0	28	0.2	wet, greenish gray			
54.0			End Exploration at Refusal 50'2"			
56.0						
58.0						
60.0						
62.0						

Legend

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li> Road Box with Bolt Down Cover, Set in Cement.</li> <li> Existing Surface.</li> <li> Bentonite Seal Placed in Annulus.</li> <li> Grade #1 Silica Sand Pack Placed in Annulus.</li> <li> Drill Cuttings Placed in Annulus.</li> <li>NA Not Applicable</li> </ul> | <ul style="list-style-type: none"> <li> Locking Plug.</li> <li> 2" ID, Schedule 40 PVC Riser.</li> <li> 2" ID, Schedule 40 PVC, 0.010"-Slotted Well Screen</li> <li> Plug Point</li> <li> Approximate Water Level During Drilling</li> <li> Static Water Level</li> </ul> |
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# SOIL BORING LOG

Boring No: SB-8



**28 North Main Street**  
Waterbury, Vermont

KAS Project #: 505140338	Date Installed: 6/2/2014	
Drilled by: T&K Drilling	Drilling Method: Hollow Stem Auger	
Driller: Sean and Kevin	Boring Diameter.: 4.25"	
Supervised by: Toni Poquette	Development Method: N/A	
Logged by: Toni Poquette	Screened Length: N/A	

Letter Symbol  
Graphic Symbol

Grade = 0	Well Construction	Pen/Rec (")	Interval (')	Soil Characteristics	Letter Symbol	Graphic Symbol
		Blow Count	PID (ppm)			
1.0		24/14	0-2	<b>Well Graded Sand w/ Gravel (SW)</b>	SW	
2.0		1,1,1,2	0.4	dry, brown / organics in top 2"		
3.0		24/16	2-4	<b>Well Graded Sand w/ Gravel (SW)</b>	SW	
4.0		2,2,1,2	0.3	dry, brown / medium and coarse sand		
5.0		24/18	4-6	<b>Well Graded Sand w/ Gravel (SW)</b>	SW	
6.0		3,5,5,8	0.4	dry, brown & multi color / medium and coarse sand		
7.0		24/15	6-8	<b>Well Graded Sand w/ Gravel (SW)</b>	GW	
8.0		6,4,6,16	0.4	dry, brown & multi color / coarse sand		
9.0		24/20	8-10	<b>Poorly Graded Gravel w/ Sand (GP)</b>	GP	
10.0		12,20,20,27	0.3	dry, brown, white, orange, and dark brown		
11.0		24/16	10-12	<b>Poorly Graded Gravel w/ Sand (GP)</b>	GP	
12.0		18,21,25,25	0.7	dry, brown, white, orange, and dark brown		
13.0						
14.0						
15.0						
16.0			16/12	15-16.25	<b>Poorly Graded Gravel w/ Sand (GP)</b>	GP
17.0		16,25,50,-		dry, brown and green/gray, some silt		
18.0				End Exploration at Refusal 16.25'		
19.0						
20.0						
21.0						
22.0						
23.0						
24.0						
25.0						
26.0						
27.0						
28.0						
29.0						
30.0						
31.0						
32.0						
33.0						
34.0						
35.0						
36.0						
37.0						
38.0						

Legend

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li> Road Box with Bolt Down Cover, Set in Cement.</li> <li> Existing Surface.</li> <li> Bentonite Seal Placed in Annulus.</li> <li> Grade #1 Silica Sand Pack Placed in Annulus.</li> <li> Drill Cuttings Placed in Annulus.</li> <li>NA Not Applicable</li> </ul> | <ul style="list-style-type: none"> <li> Locking Plug.</li> <li> 2" ID, Schedule 40 PVC Riser.</li> <li> 2" ID, Schedule 40 PVC, 0.010"-Slotted Well Screen</li> <li> Plug Point</li> <li> Approximate Water Level During Drilling</li> <li> Static Water Level</li> </ul> |
|--|---|





## **APPENDIX C**

### **SOIL TEST PIT AND SHOVEL TEST PIT LOGS**



## **Soil Test Pit Logs and Shovel Pit Logs**

Project Name: Waterbury Library / Municipal Complex Project  
Location: 28 North Main Street, Waterbury, Vermont  
Date: June 4, 2014  
KAS Project #: 505140338  
Logged By: Erik Sandblom, P.E.  
Method: Backhoe – Waterbury Water Department; Hand Shovel

Test Pit and Shovel Pit locations are illustrated on the Soil Boring, Test Pit, and Shovel Pit Location Map by KAS, Inc. dated 6/16/2014.

### **Test Pits:**

#### **TP-1**

0" – 4" Dry dark brown very fine sand loam with some shallow roots. Topsoil, organic. Loose to friable. No mottles.  
4" – 15" Dry light brown sand loam, friable. A Horizon. No mottles.  
15" – 48" Dry bright light brown sand loam, friable. No mottles.  
48" – 60" Dry light brown fine to medium sand, friable. No mottles.  
60" – 84" Dry light brown, white, black, medium to coarse sand with some silt, friable. No mottles.  
No mottles, water, or bedrock encountered in exploration.  
Sample collected from 6"-12" @ 13:55. PID Screening result – 0.2 ppm.

#### **TP-2**

0" – 5" Dry dark brown sand loam with some shallow roots. Topsoil, organic. Loose to friable. No mottles.  
5" – 14" Dry brown / dark brown very fine sand loam, friable. A Horizon. No mottles.  
14" – 60" Dry light brown very fine sand loam, friable. No mottles.  
60" – 72" Dry light brown sand loam, friable. No mottles.  
72" – 84" Dry light brown, white, black, fine to medium sand, friable. No mottles.  
No mottles, water, or bedrock encountered in exploration.  
Sample collected from 6"-12". PID Screening result – 0.3 ppm.

#### **TP-3**

0" – 4" Dry dark brown loam. Topsoil, organic. Loose to friable. No mottles.  
4" – 11" Dry brown very fine sand loam, friable. A Horizon. No mottles.  
11" – 44" Dry light brown very fine sand loam, friable. No mottles.  
44" – 76" Dry light brown sand loam, friable. No mottles.  
76" – 85" Dry light brown medium sand, friable. No mottles.  
No mottles, water, or bedrock encountered in exploration.  
Sample collected from 6"-12". PID Screening result – 0.1 ppm.

#### **TP-4**

0" – 5" Dry dark brown loam. Topsoil, organic. Loose to friable. Some roots. No mottles.  
5" – 14" Dry brown very fine sand loam, friable. A Horizon. No mottles.  
14" – 60" Dry light brown fine sand loam, friable. No mottles.  
60" – 70" Dry light brown, black, white medium sand with some silt, friable. No mottles.



## **Soil Test Pit Logs and Shovel Pit Logs**

Project Name: Waterbury Library / Municipal Complex Project  
Location: 28 North Main Street, Waterbury, Vermont  
Date: June 4, 2014  
KAS Project #: 505140338  
Logged By: Erik Sandblom, P.E.  
Method: Backhoe – Waterbury Water Department; Hand Shovel

70" – 86" Dry light brown, black, orange, white coarse sand and fine gravel, friable.  
No mottles.  
No mottles, water, or bedrock encountered in exploration.  
Sample collected from 6"-12". PID Screening result – 0.2 ppm.

### **TP-05**

0" – 6" Dry dark brown loam. Topsoil, organic. Loose to friable. Some roots. No mottles.  
6" – 14" Dry brown very fine sand loam, friable. A Horizon. No mottles.  
14" – 36" Dry light brown very fine sand loam, friable. No mottles.  
36" – 53" Dry light brown sand loam, friable. No mottles.  
53" – 86" Dry light brown, gray, white, orange, black coarse sand and fine gravel, friable. No mottles.  
No mottles, water, or bedrock encountered in exploration.  
Sample collected from 6"-12". PID Screening result – 0.2 ppm.

**Shovel Test Pits:** (6" – 12" diameter shallow shovel pits performed with a hand shovel)

### **SP-A**

0"-10" Dry dark brown loam / sand loam.  
Sample collected from 6"-10" @ 13:14. PID Screening result – 0.0 ppm.

### **SP-B**

0"-10" Dry brown / black fine gravel and sand with some silt. Fill. Broken pieces of clay brick.  
Sample collected from 6"-10" @ 13:20. PID Screening result – 0.1 ppm.

### **SP-C**

0"-12" Dry brown sand loam, lots of roots.  
Sample collected from 8"-12" @ 13:25. PID Screening result – 0.2 ppm.

### **SP-D**

0"-12" Dry dark brown organic and roots over brown sand loam and stone fill.  
Sample collected from 6"-12" @ 13:33. PID Screening result – 0.1 ppm.

### **SP-E**

0"-12" Dry dark brown organic with roots over brown sand loam  
Sample collected from 6"-12" @ 13:38. PID Screening result – 0.3 ppm.

### **SP-F**

0"-12" Dry dark brown organic with roots over brown sand loam.



## ***Soil Test Pit Logs and Shovel Pit Logs***

Project Name: Waterbury Library / Municipal Complex Project  
Location: 28 North Main Street, Waterbury, Vermont  
Date: June 4, 2014  
KAS Project #: 505140338  
Logged By: Erik Sandblom, P.E.  
Method: Backhoe – Waterbury Water Department; Hand Shovel

Sample collected from 6"-12" @ 13:43. PID Screening result – 0.2 ppm.



## **APPENDIX D**

### **SOIL SAMPLING DATA SUMMARY**



**Soil Sampling Data Summary**  
**28 North Main Street**  
**Waterbury, Vermont**

Soil Sample Sample Depth (ft.) PID reading (ppm) Sample Date	SB-3 0-6 6/3/14	SP-E 0-1 6/4/14	SP-F 0-1 6/4/14	SP-B 0-1 6/4/14	SP-C 0-1 6/4/14	TP-1 0-1 6/4/14	IROCP SSV Residential	IROCP SSV Industrial	VDH Values
<b>PAHs, EPA Method 8270 (mg/kg)</b>									
Acenaphthene	<0.007	<0.009	<0.008	<0.008	<0.009	<0.009	3400	33000	NA
Acenaphthylene	<0.007	<b>0.015</b>	<b>0.024</b>	<b>0.045</b>	<b>0.024</b>	<b>0.017</b>	NA	NA	NA
Anthracene	<0.007	<b>0.012</b>	<b>0.013</b>	<b>0.056</b>	<b>0.015</b>	<b>0.012</b>	17000	17000	NA
Benzo(a)anthracene	<b>0.020</b>	<b>0.063</b>	<b>0.075</b>	<b>0.21</b>	<b>0.075</b>	<b>0.042</b>	0.15	2.10	NA
Benzo(b)fluoranthene	<b>0.026</b>	<b>0.091</b>	<b>0.11</b>	<b>0.29</b>	<b>0.11</b>	<b>0.082</b>	0.15	2.10	NA
Benzo(k)fluoranthene	<b>0.011</b>	<b>0.034</b>	<b>0.041</b>	<b>0.11</b>	<b>0.043</b>	<b>0.029</b>	1.5	21.0	NA
Benzo(a)pyrene	<b>0.020</b>	<b>0.068</b>	<b>0.083</b>	<b>0.22</b>	<b>0.084</b>	<b>0.052</b>	0.015	0.210	0.01
Benzo(g,h,i)perylene	<b>0.015</b>	<b>0.044</b>	<b>0.053</b>	<b>0.16</b>	<b>0.060</b>	<b>0.038</b>	NA	NA	NA
Chrysene	<b>0.023</b>	<b>0.068</b>	<b>0.080</b>	<b>0.23</b>	<b>0.085</b>	<b>0.053</b>	15	210	NA
Dibenzo(a,h)anthracene	<0.007	<b>0.012</b>	<b>0.015</b>	<b>0.038</b>	<b>0.016</b>	<b>0.010</b>	0.015	0.210	NA
Fluoranthene	<b>0.040</b>	<b>0.110</b>	<b>0.13</b>	<b>0.48</b>	<b>0.15</b>	<b>0.077</b>	2300	22000	NA
Fluorene	<0.007	<0.009	<0.008	<b>0.016</b>	<0.009	<0.009	2300	22000	NA
Indeno(1,2,3-cd)pyrene	<b>0.014</b>	<b>0.046</b>	<b>0.058</b>	<b>0.17</b>	<b>0.064</b>	<b>0.041</b>	0.15	2.10	NA
2-Methylnaphthalene	<0.007	<0.009	<0.008	<0.008	<0.009	<0.009	230	2200	NA
Naphthalene	<0.007	<0.009	<0.008	<b>0.022</b>	<0.009	<0.009	3.6	18.0	1.53
Phenanthrene	<b>0.016</b>	<b>0.046</b>	<b>0.040</b>	<b>0.23</b>	<b>0.056</b>	<b>0.025</b>	NA	NA	NA
Pyrene	<b>0.035</b>	<b>0.10</b>	<b>0.12</b>	<b>0.42</b>	<b>0.14</b>	<b>0.075</b>	1700	17000	NA
Total Reported PAHs	<b>0.220</b>	<b>0.709</b>	<b>0.842</b>	<b>2.697</b>	<b>0.922</b>	<b>0.553</b>	-	-	-
<b>Total Metals, EPA Method 6020 (mg/kg, dry)</b>									
Arsenic	<b>4.7</b>	<b>8.0</b>	<b>6.3</b>	<b>22</b>	<b>9.1</b>	<b>9.6</b>	0.61	2.4	NA
Barium	<b>20</b>	<b>91</b>	<b>70</b>	<b>260</b>	<b>140</b>	<b>69</b>	15000	190000	NA
Cadmium	<0.5	<0.5	<0.5	<b>1.4</b>	<0.5	<0.5	70	800	65.6
Chromium	<b>16</b>	<b>27</b>	<b>20</b>	<b>52</b>	<b>26</b>	<b>26</b>	NDC	NDC	NDC
Lead	<b>6.6</b>	<b>39</b>	<b>130</b>	<b>1100</b>	<b>39</b>	<b>20</b>	400	800	NA
Mercury	<0.1	<0.1	<0.1	<b>0.1</b>	<0.1	<0.1	10	43	NA
Selenium	<0.5	<b>0.5</b>	<0.5	<0.5	<0.5	<0.5	390	5100	NA
Silver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	390	5100	NA
							-	-	-

NOTES:

All values reported in mg/kg, dry, unless otherwise indicated.

IROCP = April 2012 Investigation and Remediation of Contaminated Properties document.

SSV= Soil Screening Values from Appendix A of the IROCP; RSL updated November 2013; VDH updated December 2013

ND<xx = Not Detected< Detection Limit

Results reported above detection limits are indicated in bold

Detection limits and reported concentrations above the residential SSV are shaded.

NA = No IRCOCP SSV available

NDC = Not Directly Comparable

VDH = Vermont Department of Health Soil Screening Values



**Toxic Equivalency Calculations**  
**Soil Samples - June 3/4, 2014**  
**28 North Main Street**  
**Waterbury, Vermont**

<b>Contaminant</b>	<i>SB-3</i>	<i>SP-E</i>	<i>SP-F</i>	<i>SP-B</i>	<i>SP-C</i>	<i>TP-1</i>	
Benzo(a)anthracene	<b>0.002</b>	<b>0.0063</b>	<b>0.0075</b>	<b>0.021</b>	<b>0.0075</b>	<b>0.0042</b>	
Chrysene	<b>0.000023</b>	<b>0.000068</b>	<b>0.00008</b>	<b>0.00023</b>	<b>0.000085</b>	<b>0.000053</b>	
Benzo(b)fluoranthene	<b>0.0026</b>	<b>0.0091</b>	<b>0.011</b>	<b>0.029</b>	<b>0.011</b>	<b>0.0082</b>	
Benzo(k)fluoranthene	<b>0.00011</b>	<b>0.00034</b>	<b>0.00041</b>	<b>0.0011</b>	<b>0.00043</b>	<b>0.00029</b>	
Benzo(a)pyrene	<b>0.02</b>	<b>0.068</b>	<b>0.083</b>	<b>0.22</b>	<b>0.084</b>	<b>0.052</b>	
Indeno(1,2,3-cd)pyrene	<b>0.0014</b>	<b>0.0046</b>	<b>0.0058</b>	<b>0.017</b>	<b>0.0064</b>	<b>0.0041</b>	
Dibenz(a,h)anthracene	<0.007	<b>0.012</b>	<b>0.015</b>	<b>0.038</b>	<b>0.016</b>	<b>0.01</b>	
<b>Total Benzo(a)pyrene Equivalents</b>	<b>0.03</b>	<b>0.10</b>	<b>0.12</b>	<b>0.33</b>	<b>0.13</b>	<b>0.079</b>	

NOTES:

B(A)P equivalents are in parts per million (ppm)

IROCP = April 2012 Investigation and Remediation of Contaminated Properties document

SSV= Soil Screening Values from Appendix A of the IROCP; RSL updated November 2013; VDH updated December 2013

< = Not Detected above detection limit

Results reported above detection limits are indicated in bold

Concentrations above the SSV for residential site are shaded



**APPENDIX E**

**LABORATORY ANALYTICAL REPORTS**





Eric Sandblom  
KAS, Inc.  
PO Box 787  
Williston, VT 05495



Subject: Laboratory Report

Eastern Analytical, Inc. ID: 132358  
Client Identification: Waterbury Library | 505140338  
Date Received: 6/5/2014

Dear Mr. Sandblom :

Enclosed please find the laboratory report for the above identified project. All analyses were performed in accordance with our QA/QC Program. Unless otherwise stated, holding times, preservation techniques, container types, and sample conditions adhered to EPA Protocol. Samples which were collected by Eastern Analytical, Inc. (EAI) were collected in accordance with approved EPA procedures. Eastern Analytical, Inc. certifies that the enclosed test results meet all requirements of NELAP and other applicable state certifications. Please refer to our website at [www.eailabs.com](http://www.eailabs.com) for a copy of our NELAP certificate and accredited parameters.

The following standard abbreviations and conventions apply to all EAI reports:

- Solid samples are reported on a dry weight basis, unless otherwise noted
- < : "less than" followed by the reporting limit
- > : "greater than" followed by the reporting limit
- %R : % Recovery


Eastern Analytical Inc. maintains certification in the following states: Connecticut (PH-0492), Maine (NH005), Massachusetts (M-NH005), New Hampshire/NELAP (1012), Rhode Island (269) and Vermont (VT1012).

The following information is contained within this report: Sample Conditions summary, Analytical Results/Data, Quality Control data (if requested) and copies of the Chain of Custody. This report may not be reproduced except in full, without the the written approval of the laboratory.

If you have any questions regarding the results contained within, please feel free to directly contact me or the chemist(s) who performed the testing in question. Unless otherwise requested, we will dispose of the sample(s) 30 days from the sample receipt date.

We appreciate this opportunity to be of service and look forward to your continued patronage.

Sincerely,

  
Lorraine Olashaw, Lab Director

6.13.14  
Date

11  
# of pages (excluding cover letter)



# SAMPLE CONDITIONS PAGE

EAI ID#: 132358

Client: KAS, Inc.

Client Designation: Waterbury Library | 505140338

Temperature upon receipt (°C): 3.5

Received on ice or cold packs (Yes/No): Y

Acceptable temperature range (°C): 0-6

Lab ID	Sample ID	Date Received	Date Sampled	Sample Matrix	% Dry Weight	Exceptions/Comments (other than thermal preservation)
132358.01	SB-3	6/5/14	6/3/14	soil	88.9	Adheres to Sample Acceptance Policy
132358.02	SP-E	6/5/14	6/4/14	soil	78.6	Adheres to Sample Acceptance Policy
132358.03	SP-F	6/5/14	6/4/14	soil	83.1	Adheres to Sample Acceptance Policy
132358.04	SP-B	6/5/14	6/4/14	soil	84.9	Adheres to Sample Acceptance Policy
132358.05	SP-C	6/5/14	6/4/14	soil	75.5	Adheres to Sample Acceptance Policy
132358.06	TP-1	6/5/14	6/4/14	soil	78.6	Adheres to Sample Acceptance Policy

Samples were properly preserved and the pH measured when applicable unless otherwise noted. Analysis of solids for pH, Flashpoint, Ignitibility, Paint Filter, Corrosivity, Conductivity and Specific Gravity are reported on an "as received" basis.

Immediate analyses, pH, Total Residual Chlorine, Dissolved Oxygen and Sulfite, performed at the laboratory were run outside of the recommended 15 minute hold time.

All results contained in this report relate only to the above listed samples.

References include:

- 1) EPA 600/4-79-020, 1983
- 2) Standard Methods for Examination of Water and Wastewater, 20th Edition, 1998 and 22nd Edition, 2012
- 3) Test Methods for Evaluating Solid Waste SW 846 3rd Edition including updates IVA and IVB
- 4) Hach Water Analysis Handbook, 2nd edition, 1992



# LABORATORY REPORT

EAI ID#: 132358

Client: KAS, Inc.

Client Designation: Waterbury Library | 505140338

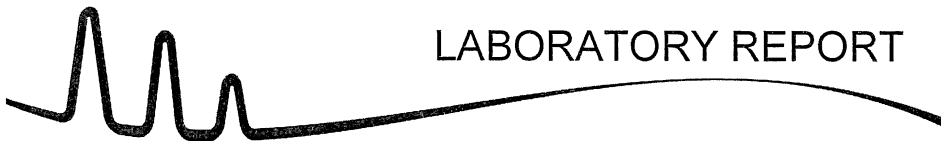
Client Sample ID: SB-3  
 Lab Sample ID: 132358.01  
 Matrix: soil  
 Date Sampled: 6/3/14  
 Date Received: 6/5/14  
 Date Prepared: 6/6/14  
 Units: mg/kg  
 Method: 8270D  
 Analyst: JMR

	Results	Dilution Factor	Date Analyzed	TEF	TEQ
Naphthalene	< 0.007	1	6/6/14		
2-Methylnaphthalene	< 0.007	1	6/6/14		
Acenaphthylene	< 0.007	1	6/6/14		
Acenaphthene	< 0.007	1	6/6/14		
Fluorene	< 0.007	1	6/6/14		
Phenanthrene	0.016	1	6/6/14		
Anthracene	< 0.007	1	6/6/14		
Fluoranthene	0.040	1	6/6/14		
Pyrene	0.035	1	6/6/14		
Benzo[a]anthracene	0.020	1	6/6/14	0.1	.002
Chrysene	0.023	1	6/6/14	0.001	.000023
Benzo[b]fluoranthene	0.026	1	6/6/14	0.1	.0026
Benzo[k]fluoranthene	0.011	1	6/6/14	0.01	.00011
Benzo[a]pyrene	0.020	1	6/6/14	1	.02
Indeno[1,2,3-cd]pyrene	0.014	1	6/6/14	0.1	.0014
Dibenz[a,h]anthracene	< 0.007	1	6/6/14	1	< .007
Benzo[g,h,i]perylene	0.015	1	6/6/14		
p-Terphenyl-D14 (surr)	68 %R		6/6/14		

TEF: Toxicity Equivalent Factor

TEQ: Toxicity Equivalence to Benzo[a]pyrene

The TEF factors set forth in this report are taken from the following EPA document: "Mid- Atlantic Risk Assessment User's Guide: November 2013". This guidance document sets forth a recommended, but not mandatory approach based upon currently available information with respect to risk assessment for response actions at CERCLA sites. This document does not establish binding rules. This document contains the most current TEF values per VT IROCP.



# LABORATORY REPORT

EAI ID#: 132358

Client: KAS, Inc.

Client Designation: Waterbury Library | 505140338

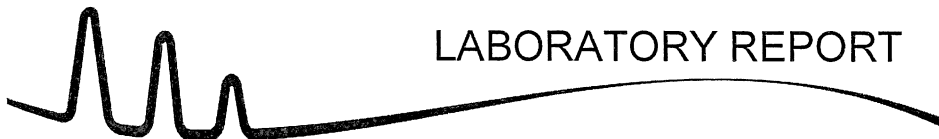
Client Sample ID: SP-E  
 Lab Sample ID: 132358.02  
 Matrix: soil  
 Date Sampled: 6/4/14  
 Date Received: 6/5/14  
 Date Prepared: 6/6/14  
 Units: mg/kg  
 Method: 8270D  
 Analyst: JMR

	Results	Dilution Factor	Date Analyzed	TEF	TEQ
Naphthalene	< 0.009	1	6/6/14		
2-Methylnaphthalene	< 0.009	1	6/6/14		
Acenaphthylene	0.015	1	6/6/14		
Acenaphthene	< 0.009	1	6/6/14		
Fluorene	< 0.009	1	6/6/14		
Phenanthrene	0.046	1	6/6/14		
Anthracene	0.012	1	6/6/14		
Fluoranthene	0.11	1	6/6/14		
Pyrene	0.10	1	6/6/14		
Benzo[a]anthracene	0.063	1	6/6/14	0.1	.0063
Chrysene	0.068	1	6/6/14	0.001	.000068
Benzo[b]fluoranthene	0.091	1	6/6/14	0.1	.0091
Benzo[k]fluoranthene	0.034	1	6/6/14	0.01	.00034
Benzo[a]pyrene	0.068	1	6/6/14	1	.068
Indeno[1,2,3-cd]pyrene	0.046	1	6/6/14	0.1	.0046
Dibenz[a,h]anthracene	0.012	1	6/6/14	1	.012
Benzo[g,h,i]perylene	0.044	1	6/6/14		
p-Terphenyl-D14 (surr)	65 %R		6/6/14		

TEF: Toxicity Equivalent Factor

TEQ: Toxicity Equivalence to Benzo[a]pyrene

The TEF factors set forth in this report are taken from the following EPA document: "Mid- Atlantic Risk Assessment User's Guide: November 2013". This guidance document sets forth a recommended, but not mandatory approach based upon currently available information with respect to risk assessment for response actions at CERCLA sites. This document does not establish binding rules. This document contains the most current TEF values per VT IROCP.



# LABORATORY REPORT

EAI ID#: **132358**

Client: **KAS, Inc.**

Client Designation: **Waterbury Library | 505140338**

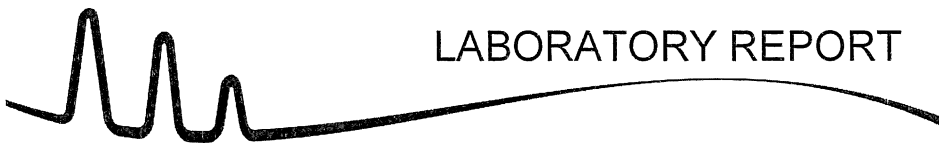
**Client Sample ID:** SP-F  
**Lab Sample ID:** 132358.03  
**Matrix:** soil  
**Date Sampled:** 6/4/14  
**Date Received:** 6/5/14  
**Date Prepared:** 6/6/14  
**Units:** mg/kg  
**Method:** 8270D  
**Analyst:** JMR

	Results	Dilution Factor	Date Analyzed	TEF	TEQ
Naphthalene	< 0.008	1	6/6/14		
2-Methylnaphthalene	< 0.008	1	6/6/14		
Acenaphthylene	<b>0.024</b>	1	6/6/14		
Acenaphthene	< 0.008	1	6/6/14		
Fluorene	< 0.008	1	6/6/14		
Phenanthrene	<b>0.040</b>	1	6/6/14		
Anthracene	<b>0.013</b>	1	6/6/14		
Fluoranthene	<b>0.13</b>	1	6/6/14		
Pyrene	<b>0.12</b>	1	6/6/14		
Benzo[a]anthracene	<b>0.075</b>	1	6/6/14	0.1	.0075
Chrysene	<b>0.080</b>	1	6/6/14	0.001	.00008
Benzo[b]fluoranthene	<b>0.11</b>	1	6/6/14	0.1	.011
Benzo[k]fluoranthene	<b>0.041</b>	1	6/6/14	0.01	.00041
Benzo[a]pyrene	<b>0.083</b>	1	6/6/14	1	.083
Indeno[1,2,3-cd]pyrene	<b>0.058</b>	1	6/6/14	0.1	.0058
Dibenz[a,h]anthracene	<b>0.015</b>	1	6/6/14	1	.015
Benzo[g,h,i]perylene	<b>0.053</b>	1	6/6/14		
p-Terphenyl-D14 (surr)	<b>68 %R</b>		6/6/14		

TEF: Toxicity Equivalent Factor

TEQ: Toxicity Equivalence to Benzo[a]pyrene

The TEF factors set forth in this report are taken from the following EPA document: "Mid- Atlantic Risk Assessment User's Guide: November 2013". This guidance document sets forth a recommended, but not mandatory approach based upon currently available information with respect to risk assessment for response actions at CERCLA sites. This document does not establish binding rules. This document contains the most current TEF values per VT IROCP.



# LABORATORY REPORT

EAI ID#: 132358

Client: KAS, Inc.

Client Designation: Waterbury Library | 505140338

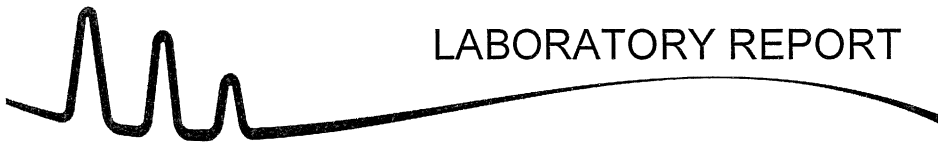
Client Sample ID: SP-B  
 Lab Sample ID: 132358.04  
 Matrix: soil  
 Date Sampled: 6/4/14  
 Date Received: 6/5/14  
 Date Prepared: 6/6/14  
 Units: mg/kg  
 Method: 8270D  
 Analyst: JMR

	Results	Dilution Factor	Date Analyzed	TEF	TEQ
Naphthalene	0.022	1	6/6/14		
2-Methylnaphthalene	< 0.008	1	6/6/14		
Acenaphthylene	0.045	1	6/6/14		
Acenaphthene	< 0.008	1	6/6/14		
Fluorene	0.016	1	6/6/14		
Phenanthrene	0.23	1	6/6/14		
Anthracene	0.056	1	6/6/14		
Fluoranthene	0.48	1	6/6/14		
Pyrene	0.42	1	6/6/14		
Benzo[a]anthracene	0.21	1	6/6/14	0.1	.021
Chrysene	0.23	1	6/6/14	0.001	.00023
Benzo[b]fluoranthene	0.29	1	6/6/14	0.1	.029
Benzo[k]fluoranthene	0.11	1	6/6/14	0.01	.0011
Benzo[a]pyrene	0.22	1	6/6/14	1	.22
Indeno[1,2,3-cd]pyrene	0.17	1	6/6/14	0.1	.017
Dibenz[a,h]anthracene	0.038	1	6/6/14	1	.038
Benzo[g,h,i]perylene	0.16	1	6/6/14		
p-Terphenyl-D14 (surr)	69 %R		6/6/14		

TEF: Toxicity Equivalent Factor

TEQ: Toxicity Equivalence to Benzo[a]pyrene

The TEF factors set forth in this report are taken from the following EPA document: "Mid- Atlantic Risk Assessment User's Guide: November 2013". This guidance document sets forth a recommended, but not mandatory approach based upon currently available information with respect to risk assessment for response actions at CERCLA sites. This document does not establish binding rules. This document contains the most current TEF values per VT IROCP.



# LABORATORY REPORT

EAI ID#: 132358

Client: KAS, Inc.

Client Designation: Waterbury Library | 505140338

Client Sample ID: SP-C  
 Lab Sample ID: 132358.05  
 Matrix: soil  
 Date Sampled: 6/4/14  
 Date Received: 6/5/14  
 Date Prepared: 6/6/14  
 Units: mg/kg  
 Method: 8270D  
 Analyst: JMR

	Results	Dilution Factor	Date Analyzed	TEF	TEQ
Naphthalene	< 0.009	1	6/6/14		
2-Methylnaphthalene	< 0.009	1	6/6/14		
Acenaphthylene	0.024	1	6/6/14		
Acenaphthene	< 0.009	1	6/6/14		
Fluorene	< 0.009	1	6/6/14		
Phenanthrene	0.056	1	6/6/14		
Anthracene	0.015	1	6/6/14		
Fluoranthene	0.15	1	6/6/14		
Pyrene	0.14	1	6/6/14		
Benzo[a]anthracene	0.075	1	6/6/14	0.1	.0075
Chrysene	0.085	1	6/6/14	0.001	.000085
Benzo[b]fluoranthene	0.11	1	6/6/14	0.1	.011
Benzo[k]fluoranthene	0.043	1	6/6/14	0.01	.00043
Benzo[a]pyrene	0.084	1	6/6/14	1	.084
Indeno[1,2,3-cd]pyrene	0.064	1	6/6/14	0.1	.0064
Dibenz[a,h]anthracene	0.016	1	6/6/14	1	.016
Benzo[g,h,i]perylene	0.060	1	6/6/14		
p-Terphenyl-D14 (surr)	73 %R		6/6/14		

TEF: Toxicity Equivalent Factor

TEQ: Toxicity Equivalence to Benzo[a]pyrene

The TEF factors set forth in this report are taken from the following EPA document: "Mid- Atlantic Risk Assessment User's Guide: November 2013". This guidance document sets forth a recommended, but not mandatory approach based upon currently available information with respect to risk assessment for response actions at CERCLA sites. This document does not establish binding rules. This document contains the most current TEF values per VT IROCP.



# LABORATORY REPORT

EAI ID#: 132358

Client: KAS, Inc.

Client Designation: Waterbury Library | 505140338

Client Sample ID: TP-1  
 Lab Sample ID: 132358.06  
 Matrix: soil  
 Date Sampled: 6/4/14  
 Date Received: 6/5/14  
 Date Prepared: 6/6/14  
 Units: mg/kg  
 Method: 8270D  
 Analyst: JMR

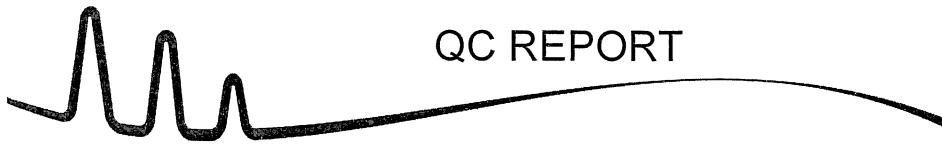
	Results	Dilution Factor	Date Analyzed	TEF	TEQ
Naphthalene	< 0.009	1	6/6/14		
2-Methylnaphthalene	< 0.009	1	6/6/14		
Acenaphthylene	<b>0.017</b>	1	6/6/14		
Acenaphthene	< 0.009	1	6/6/14		
Fluorene	< 0.009	1	6/6/14		
Phenanthrene	<b>0.025</b>	1	6/6/14		
Anthracene	<b>0.012</b>	1	6/6/14		
Fluoranthene	<b>0.077</b>	1	6/6/14		
Pyrene	<b>0.075</b>	1	6/6/14		
Benzo[a]anthracene	<b>0.042</b>	1	6/6/14	0.1	.0042
Chrysene	<b>0.053</b>	1	6/6/14	0.001	.000053
Benzo[b]fluoranthene	<b>0.082</b>	1	6/6/14	0.1	.0082
Benzo[k]fluoranthene	<b>0.029</b>	1	6/6/14	0.01	.00029
Benzo[a]pyrene	<b>0.052</b>	1	6/6/14	1	.052
Indeno[1,2,3-cd]pyrene	<b>0.041</b>	1	6/6/14	0.1	.0041
Dibenz[a,h]anthracene	<b>0.010</b>	1	6/6/14	1	.01
Benzo[g,h,i]perylene	<b>0.038</b>	1	6/6/14		
p-Terphenyl-D14 (surr)	<b>65 %R</b>		6/6/14		

TEF: Toxicity Equivalent Factor

TEQ: Toxicity Equivalence to Benzo[a]pyrene

The TEF factors set forth in this report are taken from the following EPA document: "Mid- Atlantic Risk Assessment User's Guide: November 2013". This guidance document sets forth a recommended, but not mandatory approach based upon currently available information with respect to risk assessment for response actions at CERCLA sites. This document does not establish binding rules. This document contains the most current TEF values per VT IROCP.





# QC REPORT

EAI ID#: 132358

Client: KAS, Inc.

Batch ID: 635376-40497/S060614PAH1

Client Designation: Waterbury Library | 505140338

Parameter Name	Blank	LCS	LCSD	Analysis Date	Units	Limits	RPD	Method
Naphthalene	< 0.007	1.3 (76 %R)	1.1 (64 %R) (17 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
2-Methylnaphthalene	< 0.007	1.4 (85 %R)	1.2 (73 %R) (15 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Acenaphthylene	< 0.007	1.4 (83 %R)	1.2 (72 %R) (14 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Acenaphthene	< 0.007	1.3 (77 %R)	1.1 (66 %R) (15 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Fluorene	< 0.007	1.4 (84 %R)	1.2 (73 %R) (14 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Phenanthrene	< 0.007	1.3 (79 %R)	1.1 (68 %R) (15 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Anthracene	< 0.007	1.3 (81 %R)	1.2 (70 %R) (15 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Fluoranthene	< 0.007	1.4 (82 %R)	1.2 (72 %R) (13 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Pyrene	< 0.007	1.4 (86 %R)	1.2 (73 %R) (16 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Benzo[a]anthracene	< 0.007	1.4 (81 %R)	1.2 (71 %R) (13 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Chrysene	< 0.007	1.3 (79 %R)	1.1 (69 %R) (14 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Benzo[b]fluoranthene	< 0.007	1.4 (84 %R)	1.2 (71 %R) (17 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Benzo[k]fluoranthene	< 0.007	1.4 (82 %R)	1.2 (70 %R) (16 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Benzo[a]pyrene	< 0.007	1.4 (84 %R)	1.2 (72 %R) (15 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Indeno[1,2,3-cd]pyrene	< 0.007	1.4 (81 %R)	1.2 (70 %R) (15 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Dibenz[a,h]anthracene	< 0.007	1.3 (80 %R)	1.1 (69 %R) (15 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
Benzo[g,h,i]perylene	< 0.007	1.3 (78 %R)	1.1 (67 %R) (15 RPD)	6/6/2014	mg/kg	40 - 140	30	8270D
p-Terphenyl-D14 (surr)	69 %R	79 %R	66 %R	6/6/2014	mg/kg	30 - 130		8270D

Samples were extracted and analyzed within holding time limits.

Instrumentation was calibrated in accordance with the method requirements.

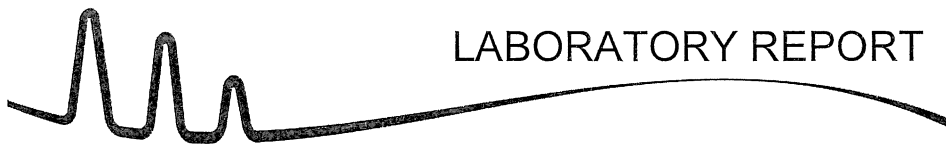
The method blanks were free of contamination at the reporting limits.

Sample surrogate recoveries met the above stated criteria.

The associated matrix spikes and/or Laboratory Control Samples met acceptance criteria.

There were no exceptions in the analyses, unless noted.

\*// Flagged analyte recoveries deviated from the QA/QC limits. Unless noted below, flagged analytes that exceed acceptance limits in the Quality Control sample were not detected in the field samples.



# LABORATORY REPORT

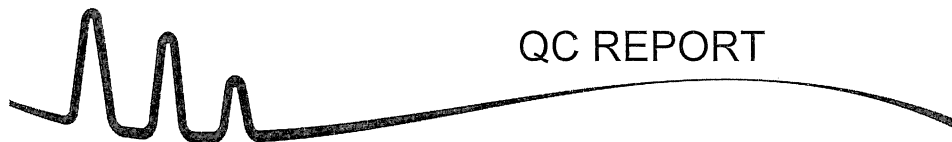
EAI ID#: **132358**

Client: **KAS, Inc.**

Client Designation: **Waterbury Library | 505140338**

Sample ID:	SB-3	SP-E	SP-F	SP-B						
Lab Sample ID:	132358.01	132358.02	132358.03	132358.04						
Matrix:	soil	soil	soil	soil						
Date Sampled:	6/3/14	6/4/14	6/4/14	6/4/14	<b>Analytical</b>			<b>Date of</b>		
Date Received:	6/5/14	6/5/14	6/5/14	6/5/14	<b>Matrix</b>	<b>Units</b>	<b>Analysis</b>	<b>Method</b>	<b>Analyst</b>	
Arsenic	<b>4.7</b>	<b>8.0</b>	<b>6.3</b>	<b>22</b>	SolTotDry	mg/kg	6/9/14	6020	DS	
Barium	<b>20</b>	<b>91</b>	<b>70</b>	<b>260</b>	SolTotDry	mg/kg	6/9/14	6020	DS	
Cadmium	< 0.5	< 0.5	< 0.5	<b>1.4</b>	SolTotDry	mg/kg	6/9/14	6020	DS	
Chromium	<b>16</b>	<b>27</b>	<b>20</b>	<b>52</b>	SolTotDry	mg/kg	6/9/14	6020	DS	
Lead	<b>6.6</b>	<b>39</b>	<b>130</b>	<b>1100</b>	SolTotDry	mg/kg	6/9/14	6020	DS	
Mercury	< 0.1	< 0.1	< 0.1	<b>0.1</b>	SolTotDry	mg/kg	6/9/14	6020	DS	
Selenium	< 0.5	<b>0.5</b>	< 0.5	< 0.5	SolTotDry	mg/kg	6/9/14	6020	DS	
Silver	< 0.5	< 0.5	< 0.5	< 0.5	SolTotDry	mg/kg	6/9/14	6020	DS	

Sample ID:	SP-C	TP-1								
Lab Sample ID:	132358.05	132358.06								
Matrix:	soil	soil								
Date Sampled:	6/4/14	6/4/14			<b>Analytical</b>			<b>Date of</b>		
Date Received:	6/5/14	6/5/14			<b>Matrix</b>	<b>Units</b>	<b>Analysis</b>	<b>Method</b>	<b>Analyst</b>	
Arsenic	<b>9.1</b>	<b>9.6</b>			SolTotDry	mg/kg	6/9/14	6020	DS	
Barium	<b>140</b>	<b>69</b>			SolTotDry	mg/kg	6/9/14	6020	DS	
Cadmium	< 0.5	< 0.5			SolTotDry	mg/kg	6/9/14	6020	DS	
Chromium	<b>26</b>	<b>26</b>			SolTotDry	mg/kg	6/9/14	6020	DS	
Lead	<b>39</b>	<b>20</b>			SolTotDry	mg/kg	6/9/14	6020	DS	
Mercury	< 0.1	< 0.1			SolTotDry	mg/kg	6/9/14	6020	DS	
Selenium	< 0.5	< 0.5			SolTotDry	mg/kg	6/9/14	6020	DS	
Silver	< 0.5	< 0.5			SolTotDry	mg/kg	6/9/14	6020	DS	



# QC REPORT

EAI ID#: 132358

Client: KAS, Inc.

Client Designation: Waterbury Library | 505140338

Parameter Name	Blank	LCS	LCSD	Units	Date of Analysis	Limits	RPD	Method
Arsenic	< 0.5	40 (101 %R)		mg/kg	6/9/14	80 - 120	20	6020
Barium	< 0.5	41 (103 %R)		mg/kg	6/9/14	80 - 120	20	6020
Cadmium	< 0.5	40 (100 %R)		mg/kg	6/9/14	80 - 120	20	6020
Chromium	< 0.5	42 (104 %R)		mg/kg	6/9/14	80 - 120	20	6020
Lead	< 0.5	41 (103 %R)		mg/kg	6/9/14	80 - 120	20	6020
Mercury	< 0.1	0.4 (103 %R)		mg/kg	6/9/14	80 - 120	20	6020
Selenium	< 0.5	40 (100 %R)		mg/kg	6/9/14	80 - 120	20	6020
Silver	< 0.5	39 (99 %R)		mg/kg	6/9/14	80 - 120	20	6020

Parameter Name	MS/MSD Parent ID	MS/MSD Parent	Matrix Spike	MSD	Units	Date of Analysis	Limits	RPD	Method
Arsenic	132358.06	9.6	950 (95 %R)	960 (95 %R) (0 RPD)	mg/kg	6/9/14	75-125	20	6020
Barium	132358.06	69	1100 (99 %R)	1100 (102 %R) (3 RPD)	mg/kg	6/9/14	75-125	20	6020
Cadmium	132358.06	< 0.5	990 (100 %R)	1000 (101 %R) (1 RPD)	mg/kg	6/9/14	75-125	20	6020
Chromium	132358.06	26	790 (76 %R)	800 (77 %R) (1 RPD)	mg/kg	6/9/14	75-125	20	6020
Lead	132358.06	20	870 (85 %R)	900 (89 %R) (5 RPD)	mg/kg	6/9/14	75-125	20	6020
Mercury	132358.06	< 0.1	1.1 (105 %R)	1.1 (108 %R) (3 RPD)	mg/kg	6/9/14	75-125	20	6020
Selenium	132358.06	< 0.5	950 (95 %R)	980 (98 %R) (3 RPD)	mg/kg	6/9/14	75-125	20	6020
Silver	132358.06	< 0.5	900 (90 %R)	910 (92 %R) (2 RPD)	mg/kg	6/9/14	75-125	20	6020

Samples were analyzed within holding times unless noted on the sample results page.

Instrumentation was calibrated in accordance with the method requirements.

The method blanks were free of contamination at the reporting limits.

The associated matrix spikes and/or Laboratory Control Samples met the above stated criteria.

Exceptions to the above statements are flagged or noted above or on the QC Narrative page.

\*! Flagged analyte recoveries deviated from the QA/QC limits.





## **APPENDIX F**

### **KAS RESUMES**



## PROFESSIONAL PROFILE

**ERIK C.F. SANDBLOM, P.E.**

<b>TITLE</b>	<b>Vice-President, Principal Engineer</b>
<b>EXPERTISE</b>	Engineering and environmental project management; civil engineering design and estimating; permitting; contract management; project scheduling; field engineering; building structural engineering, environmental engineering; stormwater management; remedial pilot testing and system design; project and operations management; hazardous waste site response and cleanup; Phase I Environmental Site Assessments; asbestos project design; UST closure inspections and system design.
<b>EXPERIENCE</b>	<p><b>KAS, Inc, Williston, VT and Plattsburgh, NY. June 2009 – present. Vice-President</b> Management, design, and oversight of civil, structural, and mechanical engineering and environmental projects. Expert witness testimony for civil engineering and environmental issues. Conduct of various engineering and environmental services. Public presentations and permitting.</p> <p><b>ESPC, Williston, VT and Plattsburgh, NY. Aug. 2000 – present. President</b> Management of main and branch office operations and personnel. Management, design, and oversight of civil, structural, and mechanical engineering and environmental projects. Expert witness testimony for civil engineering and environmental issues. Conduct of various engineering and environmental services. Public presentations and permitting. Design and analysis of water system treatment and distribution, sanitary wastewater and stormwater management, pedestrian and vehicle bridges, roadways, retaining walls, above and underground chemical and petroleum bulk storage tank systems, and pollution remediation projects. Spill Prevention, Control, and Countermeasure (SPCC) Plan development. Risk Management Plan development. Asbestos consulting</p> <p><b>Griffin International, Inc., Williston, VT. Sept. 1993 – Oct. 2004. Vice President/ Principal</b> Supervisor of engineering-related projects and manager of engineering staff. Technical supervisor of environmental and civil engineering projects. Project and personnel management. Design, management and project development for various civil, structural, and environmental engineering projects.</p> <p><b>State of Vermont Department of Environmental Conservation, Waterbury, VT. Summers 1992 and 1993.</b> Inspected underground storage tank facilities for compliance with Vermont regulations. Inspected underground storage tank removals. Developed draft policy for handling tank bottom waste.</p>
<b>ACADEMIC BACKGROUND</b>	BS Civil Engineering, The University of Vermont, 1993. Study Abroad Program, The Swedish Program, Stockholm University, 1991 Graduate Engineering Courses, University of Vermont, 1997
<b>PROFESSIONAL QUALIFICATIONS</b>	Professional Engineer, States of VT, NY, NH IFCI certified in UST Installation/ Retrofitting and UST Decommissioning NY Certified Asbestos Project Designer and Inspector 40 Hour Trained OSHA 29 CFR 1910.120 Hazardous Waste Site Worker ASTM/EPA Environmental Professional
<b>OTHER</b>	Member, ASCE; NAUI Scuba Diver; Foreign Languages: Swedish; Eagle Scout, Burlington Rotary Club (President 2013-2014); Certified Beer Judge



**KAS, INC.  
PROFESSIONAL PROFILE**

**JEREMY P. ROBERTS**

**TITLE** **Manager of State Regulated Programs, Soil Scientist**

**EXPERTISE** Environmental project management. Collection of environmental samples and operation and maintenance of hazardous waste treatment systems. Project management, geological investigations, hazardous waste site assessments, water system monitoring and maintenance, groundwater and soil contamination, remedial system design, installation, and operation. Wetland delineation. Phase I and Phase II Environmental Site Assessments.

**EXPERIENCE** **KAS, Inc., Williston, VT October 2004 – Present.** Project management. Technical report writing. Geological investigations. Hazardous waste site assessments. Phase I and Phase II environmental site assessments. Collection of groundwater, surface water, and soil samples, soil screening, and soil vapor extraction system monitoring and maintenance

**Griffin International, Inc., Williston, VT January 2002 – October 2004.** Project management. Technical report writing. Geological investigations. Hazardous waste site assessments. Phase I and Phase II environmental site assessments. Collection of groundwater, surface water, and soil samples, soil screening, and soil vapor extraction system monitoring and maintenance.

**ACADEMIC  
BACKGROUND** BS, Plant and Soil Science, University of Vermont. May 1999.

**PROFESSIONAL  
QUALIFICATIONS** 40 Hour OSHA 29CFR1910.120 Hazardous Worker Training  
40 Hour Certification in Federal Wetland Delineation, Identification, and Classification.  
Vermont Certified Asbestos Site Inspector  
ASTM/EPA Environmental Professional