INTERIM SITE CHARACTERIZATION REPORT
SKIDMORE COLLEGE, MERCURY SPILL LOCATION
NYDEC SPILL #0501301
AOC# A4-0525-0805
SITE ID 546051
SARATOGA SPRINGS, NEW YORK

PREPARED FOR:

DAN RODECKER
SKIDMORE COLLEGE
815 NORTH BROADWAY
SARATOGA SPRINGS, NY 12866

PROJECT NO. 204748
DOCUMENT NO. 32937
MARCH, 2007

NYSDEC
RECEIVED
MAR 16 2007
Region 5
Warrensburg Spill Response

PREPARED BY:

ecs

588 SILVER STREET AGAWAM, MA 01001 413.789.3530 FAX: 413.789.2776
WWW.ECSCONSULT.COM

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Certification

I certify that I am a Licensed Professional Engineer registered in the State of New York and that the work described in this report was performed under my direct supervision in full accordance with the *Site Characterization Work Plan* prepared by Environmental Compliance Services, Inc. dated June 2006 and approved by the New York State Department of Environmental Conservation on June 6, 2006, except for the deviations identified in Section 1.0 of this report.

MICHAEL E. HOPKINS
No. 064389-1

3/13/07

Michael E. Hopkins
Professional Engineer

Date

New York PE # 064389

Required Notice: New York State Education Law Article 145, Section 7209 states that it is a violation of law for any person, unless he is acting under the direction of a licensed professional engineer, to alter an item in any way that bears the seal of a professional engineer.

1.0 INTRODUCTION

The report documents a site characterization investigation performed at Skidmore College (Skidmore) in June and July 2006. The purpose of this investigation was to determine the extent and magnitude of contamination in the vicinity of an assumed mercury release on the Skidmore campus.

Elemental mercury was discovered in a utility line excavation adjacent to a water pump station on the Skidmore campus on May 2, 2005. The New York State Department of Environmental Conservation (NYDEC) Spill Hotline was notified and spill number 0501301 was assigned. NYDEC subsequently found that the site required investigation to determine whether it should be listed in the *Registry of Inactive Hazardous Waste Sites.* The site was assigned ID# 546051 as a potential registry site.

The source of the mercury was not readily apparent at the time of discovery. Immediate response actions were taken from May 2 to 4, 2005. Skidmore College received a letter dated June 10, 2005 from NYDEC, advising it to halt all work until further notice. The open excavation was temporarily backfilled in July 2005 to eliminate safety hazards, and twenty two drums of excavated soil were properly disposed of. Skidmore and NYDEC subsequently entered into Consent Order #A4-0525-0805 in August 2005.

A *Record Review Report* was submitted to the NYDEC on October 11, 2005. A *Site Characterization Work Plan* was initially submitted in November 2005. Revised *Site Characterization Work Plans* were submitted in February 2006 and June 2006. NYDEC approved the *Site Characterization Work Plan* dated June 6, 2006. The site characterization investigation was initiated in June 2006 and was performed in substantial accordance with the work plan, except for the minor deviations discussed below. This report documents the site characterization investigation activities performed to date, and provides the data obtained from those activities.

The soil characterization investigations required the minor relocation of several borings due to the presence of underground utility lines at the originally proposed locations. Mercury was detected at concentrations above the TAGM 4046 Recommended Soil Cleanup Objective (RSCO; 0.1 mg/kg for mercury) in seven of 37 soil samples (excluding duplicate samples) from five borings (B3, B5, B6, B7 and B11). The mercury concentrations exceeded 1 mg/kg in three samples (B3/0' at 4.86 mg/kg, B3/2' at 1.88 mg/kg and B6/0' at 116 mg/kg). In general, the data is consistent with field measurements that indicated the presence of mercury vapors only in boring B6. No visible elemental mercury was observed in any sample. The highest mercury concentration from each boring was encountered in the surface (0 to 6") interval. The area with mercury concentrations greater than the RSCO appears to be approximately 25 feet wide by 30 feet long, extending up to 2 feet below ground surface. ECS estimates that up to approximately 45 cubic yards of soil may have mercury concentrations greater than 0.1 mg/kg.

The data shows no indication of significant impacts from other contaminants, except for low concentrations of chlordane in several shallow soil samples. The chlordane concentration in one sample (B2/2' at 2.73 mg/kg) exceeds the TAGM 4046 Recommended Soil Cleanup Objective of 0.54 mg/kg. In our opinion, the sporadic occurrence of low concentrations of chlordane most likely resulted from historical pesticide applications, rather than waste disposal activities. Regardless, all locations where chlordane was detected are within the estimated area of mercury contamination, and will be remediated in conjunction with the mercury impacted soil

No groundwater was encountered above the bedrock surface in any boring. One bedrock monitoring well (MW-2) was installed at a location assumed to be downgradient of the mercury source area. No mercury was detected in the groundwater sample from MW-2. The other proposed monitoring well locations were determined to be in or adjacent to the mercury source area. Since it is assumed that the mercury contaminated soil will need to be removed from the source area, and since the data from MW-2 indicates that groundwater remediation is not likely to be necessary, it was decided to defer the installation of the remaining monitoring wells (and therefore, the completion of the site characterization) until after the removal of the mercury impacted soil. Therefore, this report is being submitted as an interim report, and the site characterization will be completed after removing the mercury impacted soil from the source area as an interim remedial action.

An *Interim Remedial Action Work Plan* (which includes a *Citizen Participation Plan*) will be submitted following this *Interim Site Characterization Report*. Additional groundwater investigation would be performed upon completion of the interim remedial action, and a final *Site Characterization Report* would be issued at that time.

2.0 SITE DESCRIPTION AND HISTORY

2.1 SPILL DISCOVERY AND NYDEC NOTIFICATION

Elemental mercury was discovered in a utility line excavation adjacent to a water pump station on the Skidmore College campus on May 2, 2005. The mercury was discovered when it was visually observed by the facility maintenance personnel. The excavation was stopped at that time and the NYDEC Spill Hotline was notified. Spill number 0501301 was assigned. The source of the mercury was not readily apparent at that time. Other than the visible presence of elemental mercury, no other waste materials or other visible evidence of waste disposal was observed in the open excavation.

2.2 INITIAL RESPONSE ACTIONS

Skidmore contracted Clean Harbors to perform immediate response actions on the date of discovery (May 2, 2005). An initial sample was collected from the open excavation upon arrival on May 2, 2005. Clean Harbors reportedly hand excavated "twenty two drums" of mercury impacted soil from May 2 to May 4, 2005. A sampling grid was established and five additional soil samples were collected from the point at which mercury was no longer visible on May 4, 2005. The results of the mercury analyses of the samples collected on May 2 and May 4, 2005 are summarized in Table 1. The sampling locations are shown on Figure 3. The analytical data was provided to Andy Frank of the NYDEC Region 5 office on May 16, 2005.

A meeting was held on-site between Skidmore, Clean Harbors and NYDEC staff on May 20, 2005. It was agreed at that time that additional soil sampling would be performed to further evaluate the horizontal and vertical extent of contamination. Clean Harbors returned to the site on May 24, 2005 and collected twelve additional soil samples using hand augers to five feet below grade, which was considered to be consistent with the depth to bedrock. The mercury concentrations in the sample collected on May 24, 2005 are also summarized in Table 1. The May 2, 2005 and the May 25, 2005 sampling locations are shown on Figure 3.

The open excavation was temporarily backfilled in July 2005 to eliminate safety hazards. The 22 drums of remedial waste noted above were removed from the site on July 29, 2005 by Precision Industrial Maintenance, Inc. (Precision). Precision collected representative composite samples from each drum for waste characterization analyses prior to transporting them off-site. The waste characterization analyses (which included TCLP metals analyses) determined that nineteen drums could be disposed of as non-hazardous waste since all TCLP metals concentrations (including mercury) were below the hazardous waste thresholds (0.2 mg/l for mercury). The three remaining drums (#13, 16 and 20) were disposed of as hazardous waste (due to TCLP mercury concentrations of 0.287 to 1.0 mg/l).

Upon completion of the sampling on June 10, 2005, Skidmore College instructed Clean Harbors to discontinue further remedial actions until authorized by NYDEC. Skidmore subsequently received a letter from NYDEC on June 15, 2005 directing it to halt the remedial work until further notice. Skidmore and NYDEC subsequently entered into Consent Order #A4-0525-0805, which was signed by Skidmore on August 26, 2005 and by NYDEC on September 2, 2005, with an effective date of September 12, 2005.

2.3 PREVIOUS INVESTIGATION AND REMEDIATION REPORTS

No previous site characterization or remediation reports have been prepared. Laboratory data and field notes resulting from the initial response actions were provided in the *Record Search Report* dated September 11, 2005.

2.4 SPILL LOCATION AND DESCRIPTION

The Skidmore campus includes 650 acres with approximately 50 buildings. The college's mailing address is 815 North Broadway, Saratoga Springs, New York. The campus includes parcels in both the City of Saratoga Springs and the Town of Greenfield. The spill site is located on parcel number 152.00-1-10 in the City of Saratoga Springs. Figure 1 is a site location map that shows the area occupied by the Skidmore College campus. Figure 2 shows the location of the pump house and spill site on the campus. Figure 3 provides details of the spill area[1].

The mercury spill location appears to be located 10 to 20 feet east of the southeastern corner of the water pump station. The pump house is an approximately 500 square foot (20 by 25 foot) masonry building that was constructed in 1968. There is no visible indication of discharges other than water (from condensation and occasional maintenance activities) to floor drains in the pump house. The building contains several pumps that are used to lift potable water from a municipal water tank located 800 feet north of the pump house to a distribution tower on a hilltop approximately 1,000 feet to the northwest. The pump house is heated with an electric heater, and has no potable water or sanitary service. The pumps are electrically operated. No mercury containing switches or instruments are currently present in the pump house.

There are two (2) two-inch diameter floor drains inside the pump house. Based on building plans (dated 1968), these drains discharge via two-inch diameter cast iron pipes to a subsurface French drain located immediately east of the building. The plans indicate that the French drain consists of four-inch diameter drain tiles surrounded by approximately five cubic yards of crushed stone. The invert of the drain tile is approximately three feet below grade[2]. The French drain was constructed over an existing water line trench with an invert depth of 5.5 to 6.0 feet below grade. The location of the French drain is shown on Figure 4.

The pump house has a single door located at the southeastern corner of the building. There is a concrete landing outside the door. The remainder of the area immediately around the pump house is unpaved. A concrete transformer pad is present immediately west of the building. The transformers provide low voltage electric service for the pump house and at least one other building.

There are no other buildings within 100 feet of the pump house. The nearest buildings are North Hall (Advancement Services and facilities management offices), the Hoge Heating Plant (a central boiler plant), Harter Hall (classrooms and offices) and the Dana Science Center (classrooms and laboratories).

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[1] For purposes of this report, the term "site" will be used to refer to the location where mercury was initially discovered in May 2005 (which will be referred to as the "mercury source location" or the "mercury source area") and the area within approximately 25 feet of that location.

[2] It is noted that the mercury contamination was first observed at a depth of approximately eighteen inches below grade, which is approximately eighteen inches higher in elevation than the drain tile invert. Since elemental mercury is very dense and no shallow water table is present, it is unlikely that the mercury could have traveled upwards to the depth at which it was first observed. Therefore, it appears more likely that the source was a direct spill at the location where it was discovered, rather than a discharge to the floor drains or French drain. Regardless, the site characterization investigation evaluated both potential sources.

The spill was discovered in an unpaved utility corridor. Underground electrical conduits, water lines, telephone lines, cable television lines, a natural gas line and pump control lines for the pump house are present in this corridor. Based on facility records, it appears that the majority of the underground utility lines in this corridor were either installed or relocated between 1995 and 1997, although water lines were shown at this location on a 1968 building plan. Essentially all of these lines appear to be bedded in sand backfill assumed to be from an off-site source.

The spill location is not fenced, although no visible mercury has been observed on the ground surface. The area surrounding the spill location is used primarily for employee parking and physical plant operations. That area is not routinely used for any purpose, but students and employees may walk over the site on an occasional basis.

2.5 SITE OPERATIONS

Skidmore is a private, co-education college with approximately 2,400 students. The majority of the campus is used for academic, housing and recreational purposes. Ancillary operations include utility and physical plant operations, and facility maintenance.

Pump house operations are limited to the operation of electric water pumps. These pumps are automated and/or controlled remotely from a panel in the Hoge Heating Plant (250 feet southeast of the pump house). Therefore, the pump house is not routinely manned. The only other activity in the pump house is periodic pump maintenance. No significant quantities of hazardous materials are used in the pump house and no hazardous materials are stored there. There are no mercury-containing instruments or switches in the pump house at this time.

2.6 USE AND MANAGEMENT OF MERCURY

Mercury was previously used on the Skidmore campus in flow meters, manometers, switches and thermometers. According to maintenance staff, all manufactured articles containing mercury have been removed and none are known to be in use on the campus at this time. A mercury containing flow meter was present in the pump house prior to 1992. The meter reportedly contained approximately one pound of mercury. No mercury containing items are known to have been present in the pump house since that time.

According to senior faculty with the Physics, Chemistry, Biology, Geology, Photography and Graphic Arts departments, no elemental mercury is used for academic purposes, and to the best of their knowledge, no mercury thermometers have been used in the academic labs since at least 1995. The chairman of the Chemistry department verified that she personally reviews all requisitions to purchase chemicals to be used for academic or research purposes, and that no elemental mercury has been requested or purchased in recent years.

2.7 CAMPUS HAZARDOUS WASTE MANAGEMENT

Based on facility manifest records, hazardous wastes containing mercury were removed from the site on thirteen occasions from 2000 to 2005 (excluding the twenty-two drums of mercury containing waste resulting from the spill cleanup activities in May 2005). These wastes included thermometers, broken thermometers, manometers and mercury contaminated debris (resulting from the cleaning of mercury spilled from broken thermometers, mercuric chloride and other mercury salts). Essentially all of the waste containing metallic mercury was contained in manufactured articles or spill cleanup materials from broken thermometers except for one ounce of "elemental mercury" that was found and removed from the boiler house on April 2, 2004. In general, the quantities of mercury waste removed from the site varied from one ounce to five pounds, except for a shipment of 32 pounds of "mercury in manufactured articles" on May 9, 2002. All hazardous wastes are stored in a dedicated hazardous waste storage area located more than 250 feet from the mercury spill location.

Skidmore is a small quantity hazardous waste generator (ID #NYD020670741). Hazardous wastes are generated from both academic (primarily laboratory) activities and facility maintenance. Hazardous wastes are accumulated and stored in a central hazardous waste storage area located in the facility maintenance area, and are periodically removed for disposal off-site by licensed hazardous waste haulers. The primary firms used for hazardous waste removal since 2000 have been Clean Harbors Environmental Services, Inc. (MAD03932225) and Precision Industrial Maintenance, Inc. (ID #NY0001031514). Richard G. Bussert is the primary Skidmore employee involved with hazardous waste management operations on-site.

2.8 SITE HISTORY

ECS reviewed municipal records, city directories, Sanborn Fire Insurance Company maps, aerial photographs and historical USGS topographic maps to determine the history of the Skidmore campus and the spill site. Our findings are documented in our prior *Record Review Report* and are summarized below.

The current Skidmore campus was part of a large residential estate prior to acquisition by Skidmore in 1961. The northern portion of the current campus, which includes the mercury spill location, was undeveloped except for a network of trails and carriage roads prior to that time. The pump house was built by Skidmore in 1968. A mercury containing flow meter (estimated to have contained approximately one pound of mercury) was present in the pump house until 1992. No mercury is known to have been present in the pump house since that time.

Mercury has also been used in the boiler house and in small manufactured articles at various locations throughout the campus. Based on its location, the use of mercury in the boiler house could not have resulted in the contamination discovered adjacent to the pump house in May 2005. The use of mercury containing instruments has been phased out over the last ten years, and none are currently known to be present on-site.

No elemental mercury is known to have been used on site for academic purposes. All faculty members interviewed stated that no mercury thermometers or other mercury containing instruments have been used in the laboratories for at least the last ten years.

Based on its location (immediately outside the only door to the pump house) and the characteristics of mercury that make it unlikely to migrate (in elemental form) any significant distance laterally through the soil, it is assumed that the discharge point of the mercury must have been proximate to the location at which it was discovered. There appear to be only two mechanisms by which this could have occurred. The first would be that mercury was spilled at or near the point of discovery while it was either being taken into the building or being removed from it. The other is that the mercury could have been discharged to a floor drain that subsequently discharged to the French drain in the utility trench immediately east of the pump house. As previously discussed, it is more likely that the release occurred as the result of a direct spill (rather than a discharge to the floor drain system), but both potential sources were investigated during the site characterization investigation. Since no mercury is known to have been present in the pump house since 1992, it is assumed that the spill must have occurred at or before that time.

2.9 PHYSICAL SETTING AND POTENTIAL RECEPTORS

The campus is an approximately 650 acre property, more than half of which is undeveloped. The surface elevation ranges from approximately 380 feet above mean sea level along the southern property line to approximately 500 feet on a hilltop in the central portion of the campus. The site itself is at an elevation of approximately 440 feet. A drainage divide bisects the campus from southwest to northeast. The portion of the campus that includes the site drains to the southeast. The nearest permanent surface water in that direction is Loughberry Lake, which is located approximately one-half mile southeast of the site at an elevation of 286 feet above mean sea level (based on USGS topographic maps). Loughberry Lake is used as a water supply reservoir, but there appears to be no potential for impacts to it based on its distance from the site.

The Skidmore campus and the surrounding area are served by a public water supply. The pump house is used to lift potable water from a municipal water tank located 800 feet north of the pump house to a distribution tower on a hilltop approximately 1,000 feet to the northwest. Since both the municipal water tank and the distribution tower are located approximately 60 feet higher than the spill site and the water piping is pressurized, this system would not be impacted by releases at the spill site. No private water supply wells are known to be present within 1,000 feet of the spill site or in the assumed downgradient area (that is, to the southeast between the spill site and Loughberry Lake).

The *Geologic Map of New York – Hudson-Mohawk Sheet* (New York State Museum and Science Service, 1970; reprinted 1995) indicates that the bedrock beneath the site is the Canajoharie Shale of the Lorraine, Trenton and Black River Groups. This is consistent with descriptions provided by facility personnel of bedrock ledge encountered in construction excavations in the vicinity of the site. The *Surficial Geology of New York – Hudson-Mohawk Sheet* (University of the State of New York, 1987) reports the soil as being "bedrock stipple", indicating that the depth to bedrock is typically in the range of 1 to 3 meters, with the primary soil type being glacial till. Facility personnel indicated that bedrock ledge is typically encountered in the vicinity of the site at depths of less than ten feet. The upper portion of the bedrock (to a depth of at least 60 feet) is predominantly dolomite. As will be discussed later in this report, bedrock was encountered in all of the borings performed during the site characterization investigation at depths ranging from less than two to approximately seven feet below grade. Observations of the soil exposed in open excavations in the vicinity of the site and of soil cores examined during the site characterization investigation indicate that the soil is primarily sandy glacial till. No groundwater was observed in the excavations or soil cores examined and no visible indications of seasonal high water tables (such as mottling) above the bedrock surface were observed.

The presence of groundwater in the bedrock aquifer was confirmed in monitoring well MW-2 following its drilling to 63 feet below ground surface (see Section 3.5). Fractured bedrock was encountered in well MW-2 at a depth of approximately 7 feet below grade, and competent bedrock was encountered at approximately 11 feet below grade. Based on observations made during the installation of the well, artesian groundwater is present in the bedrock aquifer, although the recharge is slow and the yield appears to be limited (less than one gallon per hour). The pieziometric surface in MW-2 appeared to stabilize at a depth of approximately 6.7 feet below grade approximately 48 hours after the completion of well development activities.

The release site is located on a portion of the Skidmore campus that is used primarily by facility maintenance personnel. In general, the only use of that area is for passage to or from the pump house and/or to service the underground utility lines that pass through it. Although the area is not fenced and may occasionally be crossed by students or others, such usage appears to be minimal and the area is not used for any purpose on a regular basis. On this basis, the only potentially significant exposure pathway identified is possible direct contact to impacted soil by construction or maintenance workers.

The pump house itself is normally unattended. The nearest regularly occupied building is North Hall, which is used primarily for office activities. This building is located approximately 200 feet east of the spill site. There are no indications that the occupants of this building would be exposed to contaminants present at the spill site. The nearest academic building is the Dana Hall addition, which is located approximately 500 feet south of the spill site. The nearest residential buildings are located along North Broadway, approximately 1,000 feet southeast of the spill site.

3.0 FIELD INVESTIGATION

3.1 PRE-BORING TASKS

ECS notified Dig Safely – New York, conducted a ground penetrating radar survey, used an inductive pipe tracer, reviewed site and utility plans provided by Skidmore College and interviewed facility personnel to identify underground utility lines at the proposed boring locations. Several of the originally proposed boring locations were relocated slightly due to the presence of underground utilities at the proposed locations. In our opinion, the final boring locations are sufficient to adequately characterize the soil conditions in the area of concern.

3.2 BORING PROCEDURES

Sixteen Geoprobe borings were performed on June 20 and 21, 2006. Michael Hopkins, Amy Butler and Neil Allen of ECS were present during the field investigation. Ms. Butler performed the field screening, air monitoring and soil sampling. Mr. Allen operated the Geoprobe.

The boring locations are shown on Figure 4. All borings were advanced to the depth of refusal. Bedrock was encountered at depths ranging from 0.5 feet to 6.8 feet. No groundwater was encountered in any boring. In general, the soils encountered in all borings consisted of brown sandy till with some gravel to the depth of refusal. Dolomite fragments in the tip of the Geoprobe sampler indicate that the refusals were due to the presence of bedrock at the depth of refusal. Boring logs are provided as Appendix A.

3.3 SOIL SAMPLING PROCEDURES

Soil samples were collected continuously from the surface to bedrock refusal using 48" long by 1.5" diameter macro-core samplers in accordance with ECS Standard Operating Procedure (SOP) #5.30[3]. A new clear PVC macro-core liner was used for each sample. The macro-core samplers were decontaminated between samples using the procedures specified in ECS SOP #10.00 (including the 10% nitric acid rinse).

3.4 FIELD SCREENING PROCEDURES

The soil in each macro-core sampler was field screened immediately upon opening using a Jerome 431-X Mercury Vapor Analyzer (MVA) and visually examined for the presence of elemental mercury. The Jerome 431-X MVA has a detection limit of 0.003 mg/m^3. MVA readings and field observations are recorded on the boring logs provided as Appendix A. The highest mercury vapor concentrations were recorded in B-6/0' (0.022-0.055 mg/m^3) and B-6/2' (0.005-0.006 mg/m^3). Mercury vapors were not detected in any other boring.

The soil in each macro-core sampler was also field screened for organic vapors using a MiniRae photoionization detector (PID). The PID was calibrated to an isobutanol standard with a known concentration of 100 ppm (parts per million) prior to use. The instrument has a detection limit of approximately 1.0 ppm total organic vapors (as benzene) when equipped and calibrated in this manner. The samples were placed in 4-ounce amber glass jars and covered with aluminum foil prior to headspace vapor screening. No field indications of contamination (such as odors, staining or free phase product) were encountered in any boring. Slightly elevated organic vapor concentrations were detected in B-13/0'

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[3] Copies of the ECS Standard Operating Procedures used in this investigation were provided in the approved Site Characterization Work Plan.

(41.9 ppm). There were no obvious indications of VOC contamination in that sample and no VOCs were detected at concentrations above the laboratory reporting limits in that sample. The samples were re-screened later in the day, and no organic headspace vapors were detected at that time. It is possible that the initial PID readings from sample B-13/0' could be attributable to interference from vehicle exhaust or another transient source, rather than the actual presence of VOCs in the samples. The organic vapor concentrations in all other borings ranged from below detection limits to 13.5 ppm, which appear to be consistent with background and are considered to be incidental. The organic vapor and mercury vapor field screening data are summarized on the boring logs provided in Appendix A.

3.5 MONITORING WELL INSTALLATION

Monitoring well MW-2 was installed on July 10 and 11, 2006. The well location is depicted on 4. Monitoring wells MW-1, MW-3 and MW-4 were not installed since the proposed locations are within the area of mercury contaminated soil. It is anticipated that this area will be excavated during future remedial activities, and that any wells within that area would be destroyed.

The well installation was performed by Aquifer Drilling and Testing, Inc. using hollow-stem auger equipment. The auger was advanced to the depth of competent bedrock (approximately five feet below grade). Bedrock coring was then performed using an RX core barrel to a depth of 63 feet below grade. Bedrock (fine-grained gray dolomite) was encountered at a depth of approximately 5 feet below grade. There were no obvious indications of water bearing fractures in the dolomite prior to a partial loss of drilling return water at approximately 58 feet below grade. The boring was advanced to a depth of 63 feet below grade. The well was constructed of two-inch nominal inside diameter PVC casing and well screen, a sand pack, a bentonite annulus seal and a gasketed, flush-mounted steel protective casing set in a grout collar. The well construction log is provided as Appendix B.

3.6 WELL DEVELOPMENT

Monitoring well MW-2 was developed via surging and overbailing in accordance with ECS SOP #3.00. The well development water was collected in a 55-gallon drum. The well could not be developed until turbidity free, primarily due to the limited recharge.

3.7 GROUNDWATER SAMPLING

Monitoring well MW-2 was sampled via low flow purging and sampling techniques in accordance with ECS SOP #8.30. Michael Hopkins of ECS performed the sampling on July 21, 2006. A ten day equilibration period was provided between the completion of the well installation and development and the initial sampling. The groundwater sample was not filtered prior to analysis. The analytical data is provided in Section 5.2.

3.8 GROUNDWATER FLOW DETERMINATION

Since only one well (MW-2) was installed, relative wellhead elevations and groundwater flow direction were not determined at this time. Upon completion of the additional monitoring wells, relative wellhead elevations will be determined using standard differential leveling procedures to a minimum accuracy of +/- 0.01 feet. The elevations will be referenced to an arbitrary on-site datum.

The depth to groundwater measured in MW-2 two hours after the completion of development activities on July 21, 2006 was 26.2 feet. The water level rose overnight to 10.9 feet below grade and ultimately stabilized at 6.7 feet below grade approximately 48 hours after the completion of development. Depth to groundwater measurements were performed prior to purging or sampling the well using a calibrated electronic probe in accordance with ECS SOP #9.00.

3.9 FIELD DECONTAMINATION PROCEDURES

Macro-core samplers and other direct contact sampling equipment were decontaminated between samples using the procedures specified in ECS SOP #10.00, including the optional 10% nitric acid rinse. The samplers were field screened prior to use with the MVA to verify the effectiveness of the decontamination. Two rinsate blank samples were collected on June 20 and one rinsate blank sample was collected on June 21 to verify the effectiveness of the decontamination procedures. The laboratory results are provided in Appendix D. The data indicates that the decontamination procedures were effective.

3.10 AIR MONITORING

Work area air monitoring was performed with a Jerome 431-X Mercury Vapor Analyzer and a photoionization detector. No mercury vapors were detected in breathing zone air samples or at the downwind limits of the work zone. Mercury vapors were detected during the field screening of soil samples from boring B-6 at concentrations up to 0.055 ppm (0.45 mg/m3) but none were detected in the breathing zone or downwind air samples while the samples from B-6 were being handled. The NIOSH 8-hour time weighted average concentration for mercury is 0.05 mg/m^3. The OSHA permissible exposure limit (PEL) for mercury is 0.1 mg/m^3. Based on the mercury vapor data, there were no exceedances of the NIOSH or OSHA limits, and no respiratory protection or work suspensions were necessary. No mercury vapors were detected during the screening of samples from any other boring.

Particulates (measured as PM-10) and organic vapor concentrations were monitored whenever intrusive work was in progress at the downwind limits of the work zone in accordance with the NYDOH Community Air Monitoring Plan. The downwind monitoring station was typically located approximately 25 feet from each boring. The downwind monitoring was performed continuously using an MSA multigas/ultrafine particulate monitor. Minimum, maximum and average PM-10 concentrations were recorded for each 15 minute interval. The instantaneous PM-10 concentrations at the downwind monitoring point ranged from 0.008 to 0.455 mg/m^3. The fifteen minute weighted average concentrations ranged from 0.020 to 0.067 mg/m^3. Since all 15 minute average concentrations were less than 0.100 mg/m^3 at the downwind monitoring point[4], no work suspensions or dust suppression actions were required.

3.11 WASTE MANAGEMENT PROCEDURES

Wastes resulting from equipment decontamination used disposable personal protective equipment and any soil from the borings that exhibited mercury vapor concentrations greater than ambient levels (which was limited to a small quantity of soil from boring B-6) were collected in a 55-gallon drum on June 20 and 21, 2006. Drilling and well development wastewater were collected in another 55-gallon drum on July 10, 11 and 12, 2006. Upon the completion of the investigation, the drummed wastes were appropriately labeled and moved to a secure location until they could be transported off-site. The wastes were stored in accordance with all applicable state and federal regulations while on-site.

Waste characterization analyses (TCPL metals and TCLP VOCs) performed on representative samples from both wells. No VOCs were detected in either sample. Low concentrations of TCLP barium and

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[4] The CAMP specifies that work be suspended and dust suppression actions be taken if the average PM-10 concentrations at the downwind monitoring point exceed those at an upwind monitoring point by 100 micrograms per cubic meter (0.100 mg/m^3). Since none of the average downwind concentrations exceeded 0.100 ug/m^3, no upwind monitoring was necessary.

lead were detected in both samples. The barium and lead concentrations were below the corresponding hazardous waste characteristic threshold. There were no field indications of free phase product, elemental mercury or ignitability in either sample. The pH of the wastewater sample was 8.2. Based on this information, and a review of the soil and groundwater sampling data, it was determined that the wastes resulting from the investigation were non-hazardous. The waste characterization analytical reports are provided in Appendix C.

4.0 ANALYTICAL SUMMARY

The laboratory analyses were performed by Spectrum Analytical, Inc., a New York State Department of Health ELAP CLP-tier certified laboratory. All analyses were performed in accordance with the procedures and QA/QC requirements specified in by the NYDEC Analytical Services Protocol (ASP). ASP Category B Data Deliverables are provided.

All sampling, sample analyses and QA/QC testing were performed in accordance with the Analytical Plan provided in Section 5 of the approved Site Characterization Work Plan. The data quality objectives included requiring that the minimum detection limits be less than the corresponding RSCO (for soil samples) and the Part 703.5 GA Groundwater Quality Standard (for groundwater samples). USEPA Method 5035 procedures were used in the collection of soil samples for volatile organic compound analysis. All groundwater samples were preserved as specified in USEPA Publication SW-846. The groundwater samples were not field filtered. Low flow purging and sampling techniques were used to ensure that the results were not unduly influenced by turbidity or suspended soils in the samples.

4.1 SOIL ANALYTICAL RESULTS

The soil sample analytical data was initially evaluated by direct comparison to the corresponding RSCOs. In the case of the metals data, consideration was given to consistency with assumed background levels. The soil samples were collected on June 20 and 21, 2006. Samples were received by the laboratory on June 21, 2006. The laboratory report is provided as Appendix D. The data is summarized in Tables 2, 3 and 4.

4.1.1 Mercury Analytical Results

Thirty seven soil samples were analyzed for mercury. Mercury was detected at concentrations above the RSCO (0.1 mg/kg) in samples B-3/0' (4.86 mg/kg), B-3/2' (1.88 mg/kg), B-5/0' (0.177 mg/kg), B-6/0' (116 mg/kg), B-6/2' (0.126 mg/kg), B-7/0' (0.443 mg/kg) and B-11/0' (0.404 mg/kg). Mercury was either non-detectable or was detected at concentrations below the RSCO in all other samples. The results of the soil sample analyses for mercury are summarized in Table 2. The mercury concentrations are presented graphically on Figure 5 (surface samples), Figure 6 (2 foot depth level) and Figure 7 (4 foot depth level). The two samples collected at the 6 foot depth level were not graphed since the results were below the laboratory reporting limits (BRL). Estimated (J) results are presented with data rounded to two significant figures followed by "J" to signify estimated value.

Results indicated that the highest mercury concentration (116 mg/kg) was detected in surface soil within the utility corridor at B-6 (10 feet northwest of the pump house door). The highest concentration of mercury (1.88 mg/kg) present at the 2 foot depth level was detected at B-3 (5 feet northeast of pump house door). Mercury was only detected in soil collected at the 4 foot depth level at B-7 (0.06 mg/kg) and B-15 (0.04J mg/kg).

4.1.2 Volatile Organic Compound Analytical Results

The VOC analytical results are summarized in Table 3. No volatile organic compounds (VOCs) were detected above the laboratory reporting limit or the RSCOs in any of the samples, except for acetone. As further discussed in Section 5.6.1, acetone is commonly produced as a result of the use of sodium bisulfate as a preservative as required by the USEPA 5035 method field extraction procedure. On that basis, the reported acetone concentrations are not considered to represent the actual presence of acetone in the soil prior to field preservation. The acetone concentrations detected were plotted on Figure 8 to determine if any trends or patterns exist that would suggest a release of acetone occurred at the site. As Figure 8 shows, the acetone concentrations are randomly distributed with no evidence of a trend or pattern attributable to a release point.

Trace concentrations of 2-butanone, bromomethane, chloroform, carbon disulfide, chloromethane, toluene, 4-isopropyltoluene and/or tetrahydrofuran were reported in various samples at concentrations below the laboratory reporting limits.

4.1.3 Semi-volatile Organic Compound Analytical Results

Sixteen soil samples were analyzed for semi-volatile organic compounds (SVOCs). The SVOC analytical results are summarized in Table 3. No SVOCs were detected above the laboratory reporting limits or the RSCOs. Trace concentrations of benzo(a)pyrene, benzo(k)flouranthene, pyrene and/or flouranthene were detected in four of sixteen samples at concentrations below the laboratory reporting limits. No other SVOCs were detected in any sample.

4.1.4 Pesticides

The pesticide analytical results are summarized in Table 3. Chlordane was detected in four of the sixteen samples analyzed for pesticides. All four of the samples in which chlordane was detected were relatively shallow (two feet or less) and were collected from the unpaved area south of the pump house. The chlordane concentration was detected above the TAGM 4046 RSCO (540 ug/kg) in sample B-2/2' (2,730 ug/kg). Chlordane was detected below the RSCO in B-1/1.5' (34.0 ug/kg), B-3/2' (81.0 ug/kg) and B-6/2' (32.3 ug/kg). Chlordane was not detected in any other sample.

The chlordane concentrations detected were plotted on Figure 9. The highest chlordane concentration (2,730 ug/kg) was detected outside the utility corridor at B-2. Chlordane was detected at 32.4 ug/kg at B-6, which is located within the corridor at the location where the highest concentration of mercury was detected.

4.1.5 Herbicides

The herbicide analytical results are summarized in Table 3. Sixteen soil samples were analyzed to herbicides. No herbicides were detected in any of these samples.

4.1.6 Polychlorinated Biphenyls (PCBs)

The PCB analytical results are summarized in Table 3. Sixteen soil samples were analyzed to PCBs. No PCBs were reported at concentrations above the laboratory reporting limit or the RSCO in any samples. PCBs were detected at an estimated concentration of 32.7 ug/kg (which is below the laboratory reporting limit) in the 1.5 foot depth sample collected at B-1, which is well below the TAGM of 1,000 ug/kg.

4.1.7 Metals

A total of 22 metals were tested in addition to mercury in the soil samples collected at depths ranging from 0.5 feet (B-1) and 6 feet (B-12 and B-13). Results are summarized in Table 4. The beryllium, chromium, iron, nickel, sodium and zinc concentrations detected in site soils exceeded the non-background RSCOs[5] in one or more samples. Most of these concentrations only slightly exceeded the RSCOs and appear to represent normal variability. The beryllium, iron and zinc concentrations detected were plotted on Figures 10, 11 and 12, respectively, to determine if any trends or patterns exist that would suggest a release of these metals occurred at the site. These metals were selected due to their detection frequency, which is required to demonstrate concentration/distribution trends. As shown for each of these metals, the concentrations detected are randomly distributed with no evidence of a trend or pattern attributable to a release point.

The only metal present at a concentration of more than ten times the RSCO was iron in five samples. The iron concentrations ranged from 9,600 to 24,200 mg/kg. The relatively high iron concentrations are consistent with the reddish color of the soil and are assumed to represent natural background conditions, although a site specific background study was not performed. Regardless, the metals concentrations, other than mercury, are not considered to pose significant risks and do not appear to warrant remedial actions.

4.2 GROUNDWATER ANALYTICAL RESULTS

The groundwater sampling data was evaluated by direct comparison to the corresponding NYDEC Part 703.5 GA Groundwater Quality Standards. A groundwater sample from MW-2 was collected on July 21, 2006. The sample was received by the laboratory on July 25, 2006. A full laboratory report is provided as Appendix E.

4.2.1 Mercury

The mercury concentrations in groundwater sample MW-2 and the accompanying duplicate were below the laboratory reporting limit (0.00006 mg/l) and the Class GA Groundwater Standard.

4.2.2 Volatile Organic Compounds

No volatile organic compounds (VOCs) were detected in groundwater sample MW-2 or the accompanying duplicate.

4.2.3 Semi-volatile Organic Compounds

No semi-volatile organic compounds (SVOCs) were detected in groundwater sample MW-2 or the accompanying duplicate.

4.2.4 Pesticides

No pesticides were detected in groundwater sample MW-2 or the accompanying duplicate.

4.2.5 Herbicides

No herbicides were detected in groundwater sample MW-2 or the accompanying duplicate.

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[5] The RSCOs for many metals is listed as a numeric concentration "or site background". Although no site specific background survey was performed, most or all of the metals concentrations reported are consistent with commonly occurring natural background ranges.

4.2.6 Polychlorinated Biphenyls

No PCBs were detected in groundwater sample MW-2 or the accompanying duplicate.

4.2.7 Cyanides

No cyanides were detected in groundwater sample MW-2 or the accompanying duplicate.

4.2.8 Metals

Various metals were detected in the groundwater sample MW-2 and the accompanying duplicate. The results are summarized in Table 5. It is noted that the metal concentrations reported in sample MW-2 are generally higher than those in the duplicate. This is assumed to be due to the presence of trace quantities of suspended solids in sample MW-2 (which were collected immediately prior to the duplicate) that were not discernable during the field sampling[6]. Regardless, the concentrations of all metals, except iron, are below the corresponding Part 703 GA groundwater standards in sample MW-2. In general, the chemical characteristics are typical of those commonly associated with moderately hard or hard groundwater. The mercury concentrations are below the laboratory reporting limit and the Part 703 GA groundwater standard.

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[6] It is noted that the groundwater samples were collected using low flow purging techniques and that the samples were not filtered prior to analysis. ECS notes that it was not possible to develop the well until "turbidity free" due to its slow recharge and limited yield. Turbidity readings taken while purging immediately prior to sampling indicate that turbidity was stable at 9.4 to 9.6 NTU. For the purposes of future monitoring events, additional well development and/or the co-analysis of both filtered and non-filtered duplicate samples may be necessary to evaluate whether the results are being influenced by residual suspended solids. This will be further evaluated when the additional monitoring wells are installed.

5.0 QA/QC AND DATA USABILITY REPORT

5.1 PURPOSE AND OBJECTIVE

The primary purpose of this project is to delineate the extent and magnitude of soil contamination in and around the suspected source area. Secondary objectives include verification of the source of the mercury, verification that no other contaminants of concern are present (or the identification of such contaminants, if present) and a determination as to whether the air or groundwater have been impacted by the presence of mercury in the soil. Data quality objectives were discussed in Section 3.0 of the Site Characterization Work Plan.

5.2 PROJECT ORGANIZATION

Michael E. Hopkins, PE served as both the Project Manager and Quality Assurance Officer. Mr. Hopkins' resume was provided in the *Site Characterization Work Plan*.

5.3 SAMPLING PROCEDURES AND EQUIPMENT DECONTAMINATION

Standard operating procedures for field operations, including sampling, sample management and equipment decontamination are provided in Appendix A of the *Site Characterization Work Plan*. The mercury vapor analyzer was operated and calibrated in accordance with the manufacturer's recommendations.

5.4 BLANK AND DUPLICATE SAMPLE ANALYSES

All analytical and quality control procedures were consistent with those specified in the *Site Characterization Work Plan*.

The following duplicate and blank samples were collected and analyzed for quality control/quality assurance purposes:

- Duplicate soil samples were collected at a frequency of one for every twenty soil samples, with a minimum number of one per day on which soil sampling is performed. A total of four duplicate soil samples (DUP-1, DUP-2, DUP-3 and DUP-4) were collected and analyzed.

- One duplicate groundwater sample (DUP) was collected and analyzed for all specified analytes.

- One field/equipment rinsate blank was be collected and analyzed for each day on which soil samples were collected. A total of three rinsate blanks (Rinse Blank 1, Rinse Blank 2 and Rinse Blank 3) were collected and analyzed.

- One trip blank was analyzed for each day on which samples are collected for volatile organic compound analyses. A total of two trip blanks (TRIP-1 and TRIP-2) were analyzed.

The concentrations in all duplicate samples correlated with those in the accompanying source samples within acceptable ranges, except for the groundwater duplicate. This discrepancy was discussed in Section 4.2.8, and is not expected to affect the usability of the data for purposes of this investigation.

5.5 LABORATORY REQUIREMENTS

All laboratory analyses were performed by Spectrum Analytical, Inc. Spectrum is a NYDOH ELAP CLP-certified laboratory that is certified in all appropriate laboratory categories. NYDEC ASP Category B laboratory deliverables were provided for all environmental media sample analyses performed under this work plan.

5.6 DATA USABILITY REPORT

The analytical data was validated in accordance with the following standards and guidelines:

- NYDEC Analytical Services Protocol (ASP), June 2000
- USEPA Publication SW-846 (for the specific analytical methods used)
- USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, Publication 9240.1-05, EPA-540/R-94/012, OSWER February 1993
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, Publication 9240.1-05-01, EPA-540/R-94/013, PB-963502, OSWER February 1994

Analytical data validation was documented and summarized in accordance with Division of Environmental Remediation Data Usability Summary Report (DUSR) guidelines. The DUSR was be prepared by Michael E. Hopkins, PE. Mr. Hopkins' resume was provided in the *Site Characterization Work Plan*.

5.6.1 Laboratory Report SA46888 (Soil Sample Analyses)

1. Completeness: The laboratory report and QA/QC package are complete as defined under the requirements for the NYDEC ASP Category B deliverables. Specifically, the following documentation is provided:

    - Sample chain-of-custody forms are provided that include all required information.
    - Case narratives are provided and complete for all analytical methods performed
    - Analytical quality assurance and quality control summary reports are provided for all analytical protocols with all required supporting documentation.
    - Calibration data and supporting documentation is provided for all analytical methods used
    - Instrument and method performance data is provided
    - Documentation is provided to establish the method detection limits for each matrix (soil only in this case)
    - Data report forms, including sample preparation logs, analytical run logs, and the calculation used to determine final concentrations is provided, and

The raw data used in the identification and quantification of the contract-specific analytes is provided.

a) All holding times were met.

b) All QC data, including blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications, except as noted in the case narratives (as discussed below). In cases where exceptions occurred, they were resolved (either by re-running the samples or by the use of alternative evaluation criteria), in accordance with the specific analytical protocol used.

c) All data were generated in accordance with the analytical protocols specified in the approved SCWP.

d) Raw data is provided in the analytical report to support results reported on the data summary sheets and quality control verification forms. An audit and evaluation of the raw data confirms the summary sample and QA/QC data.

e) The correct data qualifiers have been used for all data. These include the qualifiers "J" and "U". Acetone and 2-butanone data that may indicate the presence of these compounds as a result of the production of these compounds due to the use of sodium bisulfate as a preservative (as specified in Method 5035) are qualified as "VOC-6". No other qualifiers were used in the data summaries.

f) Specific data deficiencies, protocol deviations and quality control issues are discussed below:

VOC Analyses (SW846 8260B)

All recoveries were within the QC limits for all samples except for 1,2-dichloroethane in samples SA-46888-07, SA-446888-13 and SA446888-38. These samples were re-analyzed as SA46888-07RE1, SA46888-13RE1 and SA44688-38RE1 with acceptable surrogate recoveries. Both the original run and the re-analysis are reported. It is noted that 1,2-dichloroethane was not detected in any sample. The surrogate recovery data was determined to be acceptable.

Quality control method blanks and LCS samples were analyzed with batches 6061766, 6062168, 6070025 and 6070026. All quality control results for the method blank of 6061766, 6062168, 6070025 and 6070026 were within method criteria. All LCS samples in batches 6061766, 6062168 and 6070025 were within the method criteria. The recovery for 1,1,2-trichlorotriflouroethane was outside of acceptance limits for batch 607006. 1,1,2-trichlorotriflouroethane was not detected in any sample batched in 607006. The RPD for acetone, chloromethane, dichlorodifluoromethane, 2,2-dichloropropane, 2-hexanone, tetrachloroethene, vinyl chloride and 1,4-dioxane were outside of acceptance limits for the LCSD in batch 607026, however the percentage recoveries were within acceptable limits. The LCS was used as the CCC for batch 6070026.

Matrix spike/matrix spike duplicates were analyzed in batch 6061766. All results were within method criteria for the MS1/MSD1. Matrix spike/matrix spike duplicates were also analyzed in batch 6070026 from source sample SA46888-17. All results were within the method criteria for the MS1/MSD1. Based on the data, as qualified above, the data is acceptable with respect to quality control method blanks and LCS samples

Samples SA46888-03, SA46888-07, SA46888-07RE1, SA46888-09, SA46888-11, SA46888-13, SA46888-13RE1, SA46888-15, SA46888-20, SA46888-22, SA46888-27, SA46888-34, SA46888-36, SA46888-38, SA46888-38RE1, SA46888-40, SA46888-43 and SA46888-44 yielded acetone production, which is commonly seen using sodium bisulfate as a preservative as stated in the 5035 method. Samples SA46888-03, SA46888-07, SA46888-07RE1, SA46888-11, SA46888-13, SA46888-13RE1, SA46888-15, SA46888-20, SA46888-27, SA46888-36,

SA46888-38, SA46888-38RE1, SA46888-40, SA46888-43 and SA46888-44 yielded 2-butanone production, which is also commonly seen using sodium bisulfate as a preservative as stated in the 5035 method. The reporting limits for SA46888-17 reflect SW846 5030 extraction technique due to matrix interference using SW-846 5035A extraction technique.

SVOC Analyses (SW846 8270 - full list)

Surrogate recoveries were within the quality control limits for all samples

Quality control method blank and LCS samples were analyzed with batch 6061818, 601825 and 6061888 All quality control results were within acceptable method criteria for batch 6061818. All quality control results were within acceptable method criteria for batch 601825 with the exception of benzidine. The recovery for benzidine was outside of the acceptance criteria in the QC spike, but no reportable concentrations are present in the samples. All quality control results were within acceptable method criteria for batch 601888 with the exception of benzidine and di-n-phthalate. The recovery for benzidine and di-n-phthalate was outside of the acceptance criteria in the QC spike, but no reportable concentrations are present in the samples.

Matrix blank duplicates were analyzed in batches 6061825 and 6061888. All quality control results were within acceptable method criteria.

Matrix spikes/matrix spike duplicates were analyzed in batches 6061835 and 6061888. All quality control results were within acceptable criteria, with the exception of 1,2,4-trichlorobenzene of the matrix spike duplicate for batch 6061825. The spike recovery was outside the acceptance limits for the MSD. The batch was accepted based on acceptable LCS recovery.

PCB Analyses (SW846 8082)

Surrogate recoveries were within quality control limits for all samples.

Quality control samples were performed in batches 6061741, 6061823 and 6060245. All quality control data was within acceptable limits.

A matrix duplicate was analyzed in batches 6061741, 6061823 and 6060245. All quality control data was within acceptable limits.

A matrix spike/matrix spike duplicate was analyzed in batches 6061741, 6061823 and 6060245. All quality control data was within acceptable limits.

Pesticide Analysis (SW846 8081)

Surrogate recoveries were within quality control limits for all samples.

Quality control samples were performed in batches 6061933 and 6061755. All quality control data was within acceptable limits.

The laboratory control samples results for batch 6061698 met the method criteria.

A matrix duplicate was analyzed in batches 6061933 and 6061755. All quality control data was within acceptable limits.

A matrix spike/matrix spike duplicate was analyzed in batches 6061933 and 6061755. All quality control data was within acceptable limits, with the exception of the matrix spike and matrix spike duplicate for 4,4-DDT (p,p') in batch 6061755 due to matrix interferences. The LCS and LCSD were within acceptable limits showing that the laboratory is in control and that the data is acceptable.

Herbicide Analyses (SW846 3550B 8151)

Surrogate recoveries were within quality control limits for all samples.

Quality control samples were performed in batches 6061756 and 6061660. All quality control data was within acceptable limits.

A matrix duplicate was analyzed in batches 6061756 and 6061660. All quality control data was within acceptable limits.

Total Metals Analysis (SW846 6010B)

Matrix blanks and laboratory control samples were analyzed with batch 6061694, 6061698 and 6061789. Calcium, iron and manganese were detected at concentrations above the maximum reporting limit in the matrix blank for batch 6061694. Iron was detected at concentrations above the maximum reporting limit in the matrix blanks for batches 6061698 and 6061789. However, these concentrations are less than 10% of the sample result, which are negligible according to the method criteria. All laboratory control samples met the method criteria.

A matrix duplicate was analyzed on sample SA4688-03 for batch 6061964. The relative present difference for calcium was out of the acceptance range. The qualifier given to this exceedance is incorrect, as there is no matrix spike duplicate in this batch.

A matrix duplicate was analyzed on sample SA4688-46 for batch 6061789. The sample results for cadmium and copper were less than ten times the reporting limit. Analyses are not controlled on relative percentage difference values from such low sample concentration. The batch was accepted based on LCS/LCSD QC results.

Matrix spikes and post spikes were analyzed for sample SA46888-07 with batch 6061694, sample SA46888-22 in batch 6061698 and sample SA46888-46 with batch 6061789. The relative percent difference for calcium and magnesium in the matrix spike and post spike of sample SA46888-07 and for aluminum, calcium, iron and magnesium cannot be accurately calculated due to the high concentrations of these analytes in the sample. The concentrations of antimony and manganese in both post spike samples were out of the acceptance range. All parameters met the method criteria for the matrix spike and post spike of SA46888-46.

The CCB2 for batch 6061694 and the CCB1 for batch 6061698 contained calcium and iron at concentrations above the reporting limit. These resides were attributed to rinsing from high concentrations of calcium and iron in samples run previously for batch 6016194.

The CCB2 for batch 6061698 contained aluminum at a concentration above the reporting limit. These resides were attributed to rinsing from high concentrations of aluminum in samples run previously for batch 6061698. The CCV2 was out of the acceptance range for aluminum and iron, also due to rinsing out. The ICSA and ICSAB run two samples later were acceptable for both elements.

The iron concentration in the matrix blanks analyzed with batches 6061698 and 6061789 were above the maximum reporting limit. However, the concentrations are less then 10% of the sample results, which is negligible according to the method criteria.

Mercury (SW846 7470A)

Mercury batch 6061790 met all method criteria for matrix blank, LCS, MS/MSD and PS. The source sample for the MS and PS was SA46888-30.

A matrix duplicate was analyzed on sample SA46888-46 with batch 6061790. The concentration of mercury in the duplicate was less than ten times the reporting limit. Analyses are not controlled on RPD values from such low sample concentrations. The QC batch was accepted based on LCS QC results.

Mercury (SW846 7471A)

Batch 606193 mercury met method criteria for the matrix blank, duplicate (source sample SA46888-01), LCS, MS and PS. The MS1 and PS were analyzed for sample SA46888-02. An MS2 was analyzed on sample SA468888-20.

Batch 6061696 mercury met method criteria for the matrix blank, duplicate (source sample SA46888-22) and LCS.

An MS1 and a PS were analyzed for sample SA46888-26 with batch 6061696. An MS2 was analyzed on sample SA468888-27, for which the mercury spike recovery was outside the acceptance limits. The batch was accepted based on acceptable LCS recovery.

Batch 6061769 mercury met method criteria for the matrix blank, duplicate, LCS, MS/MSD and PS. The batch QCs were analyzed for source sample SA46888-44.

Copies of the data and QC summary pages are provided in the laboratory reports provided in Appendix D. Based on our review of the analytical and QA/QC data, it is our opinion that the soil data meets the data quality objectives specified in the *Site Characterization Work Plan*. No data deficiencies, analytical protocol deviations or quality control problems were identified that affect the usability of the data. No additional re-sampling or re-analysis is recommended.

5.6.2 Laboratory Report SA48520 (Groundwater Sample Analyses)

1. Completeness: The deliverables are complete as defined under the requirements for the NYDEC ASP Category B deliverables. Specifically, the following documentation is provided:

- Sample chain-of-custody forms are provided that include all required information.
- Case narratives are provided and complete for all analytical methods performed
- Analytical quality assurance and quality control summary reports are provided for all analytical protocols with all required supporting documentation.

- Calibration data and supporting documentation is provided for all analytical methods used
- Instrument and method performance data is provided
- Documentation is provided to establish the method detection limits for each matrix (soil only in this case)
- Data reporting forms, including sample preparation logs, analytical run logs, and the calculation used to determine final concentrations is provided, and
- The raw data used in the identification and quantification of the contract-specific analytes is provided.

1. All holding times were met

2. All QC data, including blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications, except as noted in the case narratives (as discussed below). In cases where exceptions occurred, they were resolved (either by re-running the samples or by the use of alternative evaluation criteria), in accordance with the specific analytical protocol used.

3. All data were generated in accordance with the analytical protocols specified in the approved SCWP.

4. Raw data is provided in the analytical report to support results reported on the data summary sheets and quality control verification forms. An audit and evaluation of the raw data confirms the summary sample and QA/QC data.

5. The correct data qualifiers have been used for all data. These include the qualifiers "J" and "U". No other qualifiers were used in the data summaries.

6. Specific data deficiencies, protocol deviations and quality control issues are discussed below:

VOC Analyses (SW 846 8260B)

Surrogate Recovery were within the QC limits for all samples

Quality control method blank and LCS samples were analyzed with batch 6071746. All quality control results for the method blank for 6071746 were within method criteria. All LCS samples in batch 6071746 were within method criteria. Matrix spike/matrix spike duplicates were analyzed in batch 6071746 from a sample that is not from this sample delivery group. All results were within method criteria for the MS1/MSD1.

Samples SA48520-01 and SA48520-02 had insufficient preservative to reduce the sample pH to less than 2.

SVOC Analyses (SW 846 8270 – full list)

Surrogate recovery was within the quality control limits for all samples, except that the surrogate was inadvertently not spiked into the LCS for batch 6071674. The batch was accepted since all analytes in the LCS fell within the method acceptance range.

Quality control method blank and LCS samples were analyzed with batch 6071674. All QC results were within acceptable method criteria with the exception of the surrogate recovery for the LCS noted above.

The recovery for 4-nitrophenol was outside of the method acceptance range in 0610013-CCV1 and 061003-CCV2, however, the batch was accepted since there were no reportable concentrations in related sample group for 4-nitrophenol.

Polychlorinated Biphenyl Analyses (SW846 8082)

Surrogate recoveries were within QC limits for all samples. Blank and LCS samples were performed in batch 6071676. All QC data was within acceptable limits.

Pesticide Analyses (SW846 8081)

Surrogate recoveries were within QC limits for all samples. Blank and LCS samples were performed in batch 6071677. All QC data was within acceptable limits.

Herbicide Analyses (SW846 8151)

Surrogate recoveries were within QC limits for all samples. Blank and LCS samples were performed in batch 6071678. All QC data was within acceptable limits.

Total Metals Analyses (SW846 6010B)

A method blank was analyzed with batch 6071628. The blank met all method criteria.

LCS samples were analyzed with batch 6071628. The LCS samples identified as BS1 and BSD1 met all criteria except for potassium. The QC batch was accepted for potassium based upon the MSD, a QC sample digested with the batch, meeting the LCS criteria of 85-115%

A matrix duplicate was analyzed from source sample SA48520-01 in batch 6071628. The sample concentrations for thallium, arsenic, beryllium and copper were less than ten times the reporting limit. Analyses are not controlled on relative percent differences from such low sample concentrations. The QC batch was accepted based upon LCS and LCSD QC results.

A matrix spike, matrix spike duplicate and post spike were analyzed from sample SA48520-02 in batch 6071628. The spike recovery for sodium exceeded the acceptance criteria for the MS and PS. The percent recovery cannot be accurately calculated due to the high concentration of sodium in the sample. The QC batch was accepted based upon the LCS and LCSD QC results.

The sodium CCV1 and CCV2 was a separate single source standard. It was prepared at a concentration greater than the multi-element CCV. A factor of 0.2 was applied to the sodium CCV. Cadmium in CCV2 exceeded the acceptance criteria; however, all samples were below reportable limits.

Arsenic and calcium exceeded the acceptance criteria for CCB1 and CCB2. Zinc and iron exceeded the acceptance criteria for CCB1. The samples for these analyses are either below reportable limits or greater than 10 times the CCB value.

The original data did not include the correct spike information for the LCS/LCSD, MS/MSD and PS. Therefore, no spike recoveries were calculated which indicated that batch QC was within method criteria. The spike information was corrected when preparing this data package and the exceedances have been summarized above. Corrected data forms were provided with the QC data package.

Mercury (SW846 7471A)

Batch 6071630 for mercury met all method criteria for the matrix blank, LCS, source sample duplicate (SA48520-01), MS/MSD and post-spike from source sample SA48520-02.

Total Cyanide (SW846 9012A)

All quality controls for cyanide in batch6080172 were within acceptable method criteria. An MSMSD was analyzed in batch 6080172 from a source sample not of this sample delivery group. All QC results were within acceptable method standards.

Based on our review of the analytical and QA/QC data, it is our opinion that the groundwater data meets the data quality objectives specified in the *Site Characterization Work Plan*. Copies of the data and QC summary pages are provided in the laboratory reports provided in Appendix E. No data deficiencies, analytical protocol deviations or quality control problems were identified that affect the usability of the data. No additional re-sampling or re-analysis is recommended.

6.0 DATA INTERPRETATION AND REVISED CONCEPTUAL SITE MODEL

The *Site Characterization Work Plan* was based on a conceptual site model that assumed that the presence of elemental mercury in the soil resulted from an historic spill incident. The only known use of elemental mercury in the vicinity of the discovery location was in a flow meter that was removed from the pump house in 1992. Therefore, it was assumed that the spill occurred prior to that date. Two conceptual spill scenarios were identified. The most likely was that mercury was spilled while being transported in or out of the building. The second (and less likely) scenario was that mercury was discharged to a floor drain inside the pump house that subsequently discharged to the french drain in the utility trench adjacent to the building. Impacted media could include the soil, groundwater and/or air. Based on the physical characteristics of elemental mercury, it was assumed that the extent of lateral movement through the soil would be limited. Therefore, the site characterization investigation focused primarily on the area within approximately 25 feet of the location where the mercury contamination was originally detected. Since elemental mercury has limited solubility in water, and since no groundwater had been encountered during utility excavations or during immediate response actions in June 2005, extensive groundwater contamination was not expected to be present. There were no indications that other hazardous materials have been released in the vicinity, however, no analytical data was available for contaminants other than metals to verify that assumption. The scope of work for the site characterization investigation (including the investigatory methods, the media to be sampled, the sample locations, the analytical parameters, the health and safety plan and the QA/QC plan) was developed based on the model summarized above.

The conceptual model was revised based on the data from the site characterization investigation. The mercury concentrations exceeded 1 mg/kg in three soil samples (B3/0' at 4.86 mg/kg, B3/2' at 1.88 mg/kg and B6/0' at 116 mg/kg), all of which are located at or proximate to the location at which mercury was initially discovered in 2005. In general, the laboratory data is consistent with field mercury vapor measurements that indicated the presence of mercury vapors only in boring B6. No visible elemental mercury was observed in any sample. In general, the highest mercury concentration from each boring was encountered in the surface (0 to 6") interval.

It is particularly noted that the highest mercury concentration was found in a surficial sample from boring B-6, which was located within the area excavated by Clean Harbors in 2005. Therefore, this is assumed to be a sample of the soil used to backfill the excavation. Based on interviews with facility maintenance staff, the open excavation was backfilled partially with soil from a temporary stockpile that was assumed to be clean (based on the absence of visible mercury in it). Based on our findings, it appears that residual mercury may have been present in that soil. It is also noted that essentially all other samples with significant mercury concentrations were surficial. Since elemental mercury is not likely to disperse or migrate laterally through the soil, it appears likely that the mercury in soil samples collected proximate to the assumed source area may have been impacted by the tracking or handling of soil excavated from the source area (either during historic utility maintenance excavations or the initial response actions in 2005). Regardless, the data indicates that the area with mercury concentrations greater than the RSCO is limited to an approximately 20 feet wide by 30 feet long area, with all concentrations in excess of the RSCO being at depths of less than two feet. On this basis, ECS estimates that up to approximately 45 cubic yards of soil may have mercury concentrations greater than 0.1 mg/kg.

The data shows no obvious indication of impacts from other contaminants, except for low concentrations of chlordane in several shallow soil samples. The chlordane concentration in one sample (B2/2' at 2.73 mg/kg) exceeds the RSCO of 0.54 mg/kg. In our opinion, the sporadic occurrence of low concentrations of chlordane most likely resulted from historical pesticide applications, rather than waste disposal activities. Regardless, all locations where chlordane was detected are within the estimated area of mercury contamination, and will be remediated in conjunction with the mercury impacted soil. It is noted that various metals and trace concentrations of volatile organic compounds polyaromatic hydrocarbons (typically below the laboratory reporting levels) were detected, but none appear to be associated with hazardous material releases or appear to warrant remedial actions.

No groundwater was encountered above the bedrock surface in any boring. One bedrock monitoring well (MW-2) was installed at a location assumed to be downgradient of the mercury source area. The mercury concentrations in the groundwater sample from MW-2 were below the laboratory reporting limits. The other proposed monitoring well locations were determined to be in or adjacent to the mercury source area. Since it is assumed that the mercury contaminated soil will need to be removed from the source area, and since the data from MW-2 indicates that groundwater remediation is not likely to be necessary, it was decided to defer the installation of the remaining monitoring wells (and therefore, the completion of the site characterization) until after the removal of the mercury impacted soil. Therefore, this report is being submitted as an interim report, and the site characterization (that is the completion of the groundwater investigation) will be completed after removing the mercury impacted soil from the source area as an interim remedial action.

Air monitoring performed during the site characterization investigation indicates that the ambient atmosphere has not been impacted by mercury vapors or volatile organic compounds.

7.0 CONCLUSIONS

The site characterization investigation was initiated in June 2006 and was completed in substantial conformance with the approved work plan, except for the minor relocation of several borings due to the presence of underground utility lines at the originally proposed locations. Mercury was detected at concentrations above the RSCO (0.1 mg/kg) in seven of 37 soil samples (excluding duplicate samples) from five borings (B3, B5, B6, B7 and B11). Five of the samples were collected from the ground surface and two were collected at the 2 foot depth level. Mercury was not detected above RSCO in soil samples collected at the 4 or 6 foot depth levels.

The highest mercury concentration (116 mg/kg) was detected in surface soil within the utility corridor approximately 10 feet northwest of the pump house door (B-6). The highest concentration of mercury (1.88 mg/kg) present at the 2 foot depth level was detected 5 feet northeast of pump house door (B-3). Mercury was only detected in soil collected at the 4 foot depth level at B-7 (0.06 mg/kg) and B-15 (0.04J mg/kg).

In general, the data is consistent with field mercury vapor measurements that indicated the presence of detectable mercury vapors only in boring B-6. No visible elemental mercury was observed in any sample.

The volume of mercury impacted soil requiring excavation was estimated based on the information provided in Figures 5 and 6, which show mercury isoconcentration contours based on results obtained from samples collected form the ground surface and the 2 foot depth level. The area where mercury was detected at concentrations greater than the RSCO (0.1 mg/kg) appears to be approximately 20 feet wide by 30 feet long, or approximately 600 square feet. Based on a conservative depth estimate of 2 feet where mercury impacted soil above 0.1 mg/kg may be present, the volume of soil to be removed was calculated to be approximately 45 cubic yards (based on the 0.1 mg/kg mercury isoconcentration contours presented on Figures 5, 6 and 7).

The data shows no obvious indication of impacts from other contaminants, except for trace concentrations of chlordane in several shallow soil samples. The chlordane concentration in one sample (B2/2' at 2.73 mg/kg) exceeds the TAGM 4046 Recommended Soil Cleanup Objective of 0.54 mg/kg. In our opinion, the sporadic occurrence of low concentrations of chlordane most likely resulted from historical pesticide applications, rather than waste disposal activities. Regardless, all locations where chlordane was detected are within the estimated area of mercury contamination, and will be remediated in conjunction with the mercury impacted soil.

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An *Interim Remedial Action Work Plan* (including a *Citizen Participation Plan*) is be prepared and will be submitted following this *Interim Site Characterization Report*. Additional groundwater investigation would be performed upon completion of the interim remedial action, and a final *Site Characterization Report* would be issued at that time.