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## JUNE / JULY 2007 SURFACE WATER AND SUPPLEMENTAL SUBSURFACE INVESTIGATION RESULTS

FOR

**SOLDIER HILL ROAD  
PARAMUS BOROUGH, BERGEN COUNTY, NEW JERSEY  
NJDEP CASE No. 03-07-11-0516-34  
NJDEP SRP PI No. 197810  
MC Project No. 02-00683D**

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 BLOCK 7706, LOT 1  
 PARAMUS BOROUGH, BERGEN COUNTY, NEW JERSEY

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## Executive Summary

Twelve soil samples consisting of historic fill were collected from within the 300-foot stream buffer of the tributary to Soldier Hill Brook that flows to the west across the southern portion of the site and in turn discharges to Musquapsink Brook. Two surface water samples and one sediment sample were collected from the Soldier Hill Brook tributary and a single surface water sample was collected from the site interior wetland. The samples were collected in an effort to further characterize the historic fill within the 300-foot stream buffer and to provide data to enable an assessment of potential surface water and sediment impacts related to the presence of the site historic fill. Eight of the historic fill samples were analyzed for base neutral organic compounds and priority pollutant metals and the remaining 4 historic fill samples, the sediment sample, and the 3 surface water samples were analyzed for priority pollutants.

The analytical data from soil samples collected in the stream buffers clearly indicate the presence of various priority pollutant metals, base neutral organic compounds, and one form of PCB at concentrations in excess of the New Jersey Department of Environmental Protection (NJDEP) Residential Direct Contact Soil Cleanup Criteria (RSCC) by factors ranging from 1 for PCBs to 5 for the PAH benzo(a)pyrene. Priority pollutant metals in excess of the RSCC were identified in approximately 80 percent of the samples. BNs and PCBs were both identified at concentrations equal to or in excess of the RSCC in one of the 12 samples.

The analytical data for the surface water samples document an increase in PPM concentration in the waters of Soldier Hill Brook tributary with increasing residence time with the historic fill present at the site. Lead was detected above NJDEP Surface Water Quality Criteria (SWQC) in tributary surface water sample SW-2. Four PPMs, mercury, arsenic, cadmium, and lead were detected above the SWQC in sample SW-3 collected from the interior wetland.



## Introduction / Scope

The present scope of work was designed and implemented by Maser Consulting P.A. (Maser) in order to further characterize the nature and distribution of contaminants present within the historic fill present at the subject site and especially that fill present within the 300 foot stream buffer for the tributary to Soldier Hill Brook that flows to the west across the southern portion of the site. Soldier Hill Brook discharges to Musquapsink Brook which eventually discharges to the Category One classified Oradell Reservoir. Analytical testing of previous soil samples at the site was generally limited to priority pollutant metals (PPM) as a result of the decision to use the New Jersey Department of Environmental Protection (NJDEP) historic fill database table to characterize the historic fill contaminants pursuant to N.J.A.C. 7:26E-4.6(b)3. Surface water and sediment samples were collected in order to enable an assessment of existing surface water quality and stream sediment at the site.

On June 25, 2007 Maser professionals mobilized to the site to advance 12 soil borings, B-26 through B-37, using hand augers and to collect a soil sample from each of the borings. The samples were submitted to a NJDEP certified analytical laboratory to undergo analyses for either: 1) Priority Pollutant Metals (PPM) and Base Neutral Organic Compounds with a 15 compound library search (BN+15), or 2) Priority Pollutants (PP+40).

On July 12, 2007 Maser professionals mobilized to the site to collect three surface water samples and one sediment sample. The surface water samples were collected from the tributary to Soldier Hill Brook at the following locations: 1) SW-1 was collected at the culvert where the tributary enters the site from the north beneath both Cedar Park Cemetery and Soldier Hill Road, 2) SW-2 was collected from a location near the southeast limit of the historic fill where the tributary is in close proximity to the historic fill, 3) SW-3 was collected from the interior wetland location that consists of a closed depression approximately 25 feet in diameter that seasonally contains surface water. One sediment sample, SED-1, was collected from the bed of the tributary adjacent to the location of SW-2. Figure No. 1 illustrates the site location with respect to cultural and natural resources in Bergen County, New Jersey. Table No. 1 is a summary of sample identifications, sample matrix, collection depths, and analytical parameters. Figure No. 2 and Figure No. 3 illustrate the sample locations with respect to pertinent site features.

## Field Procedures

Soil samples were collected via soil borings advanced with a hand auger in accordance with the NJDEP August 2005 Field Sampling Procedures Manual. Complete soil boring logs were maintained for each soil boring and the soils were classified in accordance with the Unified Soil Classification System (USCS) and included a visual assessment of whether or not the materials encountered were native soil or historic fill. If present, visual and olfactory signs of contamination were noted on the respective log. Soil samples were field scanned with a photo-ionization detector (PID) to assess the samples

for the presence of volatile organic compounds. The hand auger barrels were decontaminated between boring locations using the NJDEP approved 3-step field equipment decontamination procedure. Soil samples were directly transferred from the auger barrel into laboratory decontaminated sample containers.

Surface water samples were collected via grab directly into the laboratory decontaminated glassware, or in cases where the water depth was insufficient to submerge the sample glassware sufficiently to provide adequate sample volume, a dedicated laboratory decontaminated 16 ounce wide mouth glass jar was used to gently transfer water from the source into the sample containers. The sediment sample was collected with the use of a dedicated stainless steel scoop.

The samples were maintained at a temperature between 0 and 4 degrees Celsius in a cooler while in the field as well as during transportation to the analytical laboratory. Chain-of-Custody protocols were maintained throughout sample handling. Drill cuttings were returned to the borehole after sample collection. Location data for each boring was obtained with a Garmin E-Trex Vista Cx handheld consumer GPS unit. Location data accuracy was generally within 25 feet based on comparison of field GPS position data with that of known locations.

## Findings

### Subsurface Findings

All of the soil samples submitted for laboratory analyses consisted of historic fill and were collected from within either the 150-foot or 300-foot stream buffer to the Soldier Hill Brook tributary. The historic fill, when classified by the USCS, generally consisted of tan to brown silty Sand with gravel (SM) and cinders, glass fragments, and metal fragments. Native soil, when encountered below the fill, generally consisted of black organic silt (OL).

No PID readings above background levels were obtained from any of the soil borings, nor were obvious odors or visible signs of contamination present in the soil / fill removed from the borings. Groundwater was not generally encountered in these shallow borings. Based on previous subsurface exploration at the site, groundwater is generally present at or near the contact between the historic fill and the native site soils at depths ranging from 3 feet to 5 feet below existing grade of historic fill. Soil boring logs are included herein as Appendix A.



## Analytical Findings

### Soil Samples

The analytical data indicate the absence of detectable volatile organic compounds in the soil samples. The methylene chloride detected in several of the samples is a common laboratory solvent and is in all likelihood a laboratory artifact.

Various priority pollutant metals were present in the samples at concentrations in excess of the NJDEP RSCC. The metals included arsenic, antimony, barium, copper, lead, and zinc. Of the 12 samples collected and analyzed for PPMs, 10 samples contained one or more PPMs at concentrations in excess of the RSCC. Lead was the most common PPM detected at concentrations in excess of the RSCC and was identified in 9 of the 12 samples at concentrations that ranged from 430 mg/kg to 1,800 mg/kg; the RSCC for lead is 400 mg/kg. Arsenic and barium were identified at elevated concentrations in 3 of the 12 samples.

Base neutral organic compounds were identified at concentrations in excess of the RSCC in 1 of the 12 samples, namely, B-26. This sample contained 5 polyaromatic hydrocarbons (PAHs) at elevated concentrations: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo[a,h]anthracene, and indeno[1,2,3-cd]pyrene. These compounds were detected at concentrations that ranged from twice the RSCC to 5 times the RSCC.

The PCB Aroclor-1254 was identified in one sample, namely B-35, at a concentration of 0.49 mg/kg which is equivalent to the RSCC for this analyte. Table No. 2 through Table No. 6 summarize the analytical data.

### Surface Water and Sediment Samples

The analytical results indicate that surface water sample SW-1 contained two volatile organic analytes at concentrations in excess of the NJDEP Surface Water Quality Criteria for class FW2 waters (SWQC), namely, bromodichloromethane at 1.5 ug/l (SWQC of 0.266 ug/l) and chloroform at 11 ug/l (SWQC of 5.67 ug/l). One PPM, barium, was detected at concentrations above the laboratory minimum detection limit and below the SWQC. No other targeted analytes were present in this sample at concentrations in excess of the SWQC.

The analytical results indicate that surface water sample SW-2 contained one PPM at a concentration in excess of the SWQC, namely, lead at a concentration of 5.5 ug/l (SWQC of 5 ug/l). Two additional PPMs, barium and zinc, were detected in this sample at concentrations above the laboratory minimum detection limit and below the SWQC. No other targeted analytes were present in this sample at concentrations in excess of the SWQC.

The analytical results indicate that surface water sample SW-3 contained 3 PPMs at concentrations in excess of the SWQC: mercury at 0.37 ug/l (SWQC of 0.144), arsenic at 9.7 ug/l (SWQC of 0.017 ug/l), and lead at 160 ug/l (SWQC of 5 ug/l). Six additional PPMs, antimony, barium, chromium, copper, nickel, and zinc were detected in this sample at concentrations above the laboratory minimum detection limit and below the SWQC. No other targeted analytes were present in this sample at concentrations in excess of the SWQC.

The analytical results indicate that sediment sample SED-1 contained one base neutral organic compound in excess of the SWQC, namely, benzo(b)fluoranthene at 1.1 mg/kg (RSCC of 0.9 mg/kg). Eight PPMs: mercury, barium, cadmium, chromium, copper, lead, nickel, and zinc, were detected in this sample at concentrations above the laboratory minimum detection limit and below the RSCC. Table No. 2 through Table No. 10 summarize the analytical data.

## Evaluation and Recommendations

The analytical data indicate the presence of several PPMs, including arsenic, antimony, barium, copper, lead, and zinc at concentrations in excess of the RSCC in the soil samples collected from within the stream buffer. The magnitude of the RSCC exceedences ranged from 1 for arsenic to 4.5 for lead. Several PAHs were identified in the B-26 sample at concentrations that ranged from approximately twice the RSCC to a factor of 5 times the RSCC.

The subsurface findings were consistent with previous findings at the site. No previously un-encountered classes or additional types of historic fill were encountered above and beyond those described in previous site remedial investigations.

The analytical results are consistent with previous findings at the subject site and are also consistent with the contaminant types and concentrations reported in the NJDEP Historic Fill Database Table from N.J.A.C. 7:26E-4.6.

The data clearly indicate the ubiquitous presence of PPM at concentrations in excess of the RSCC in soil samples collected within the 300-foot stream buffer. Furthermore, the data also indicate the presence of PAH's and the PCB aroclor-1254 at concentrations equal to or in excess of the RSCCs for these compounds in soil samples collected within the 300-foot stream buffer.

There is a clear trend for increasing PPM concentrations in the Soldier Hill Brook tributary surface water samples. The upstream sample SW-1, collected at the location where the tributary enters the northern portion of the site via a culvert beneath Soldier Hill Road, contained one detectable PPM, namely, barium at a concentration of 57 ug/l. Sample SW-2, collected from a location where the tributary flows immediately adjacent to the historic fill, contained 3 detectable PPMs, namely, barium, lead, and zinc. The

barium concentration increased by approximately 40 percent in comparison to the upstream location SW-1. Ten PPMs were present at concentrations above the laboratory minimum detection limit in the sample collected from the interior wetland, SW-3, 4 of which were in excess of the SWQC. This observation is likely a result of the increased residence time of the water with the underlying historic fill at this location.

These data suggest that the historic fill is the source of the PPMs identified in surface water samples SW-2 and SW-3. This conclusion supported by the facts that: 1) PPM concentrations increase with increased surface water residence time in contact with the historic fill, and 2) The PPMs identified in the surface water samples have all been identified in the historic fill at high concentrations.