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NEW YORK STATE
DEPARTMENT OF TRANSPORTATION
Albany, New York

POST-CLOSURE QUARTERLY LANDFILL MONITORING
First Quarter

Harrison Subresidency

D008873 P.I.N. 8806.51.101
Town of Harrison
Westchester County, New York

October 2000

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Prepared By

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NEW YORK STATE DEPARTMENT OF TRANSPORTATION
ALBANY, NEW YORK

HARRISON SUBRESIDENCY
WESTCHESTER COUNTY
POST-CLOSURE QUARTERLY MONITORING RESULTS

D008873, PIN 8806.51.101

QUARTERLY REPORT
October 2000

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File: 446-156

HARRISON SUBRESIDENCY
WESTCHESTER COUNTY
POST-CLOSURE QUARTERLY MONITORING RESULTS
D008873, PIN 8806.51.101

1.0 INTRODUCTION

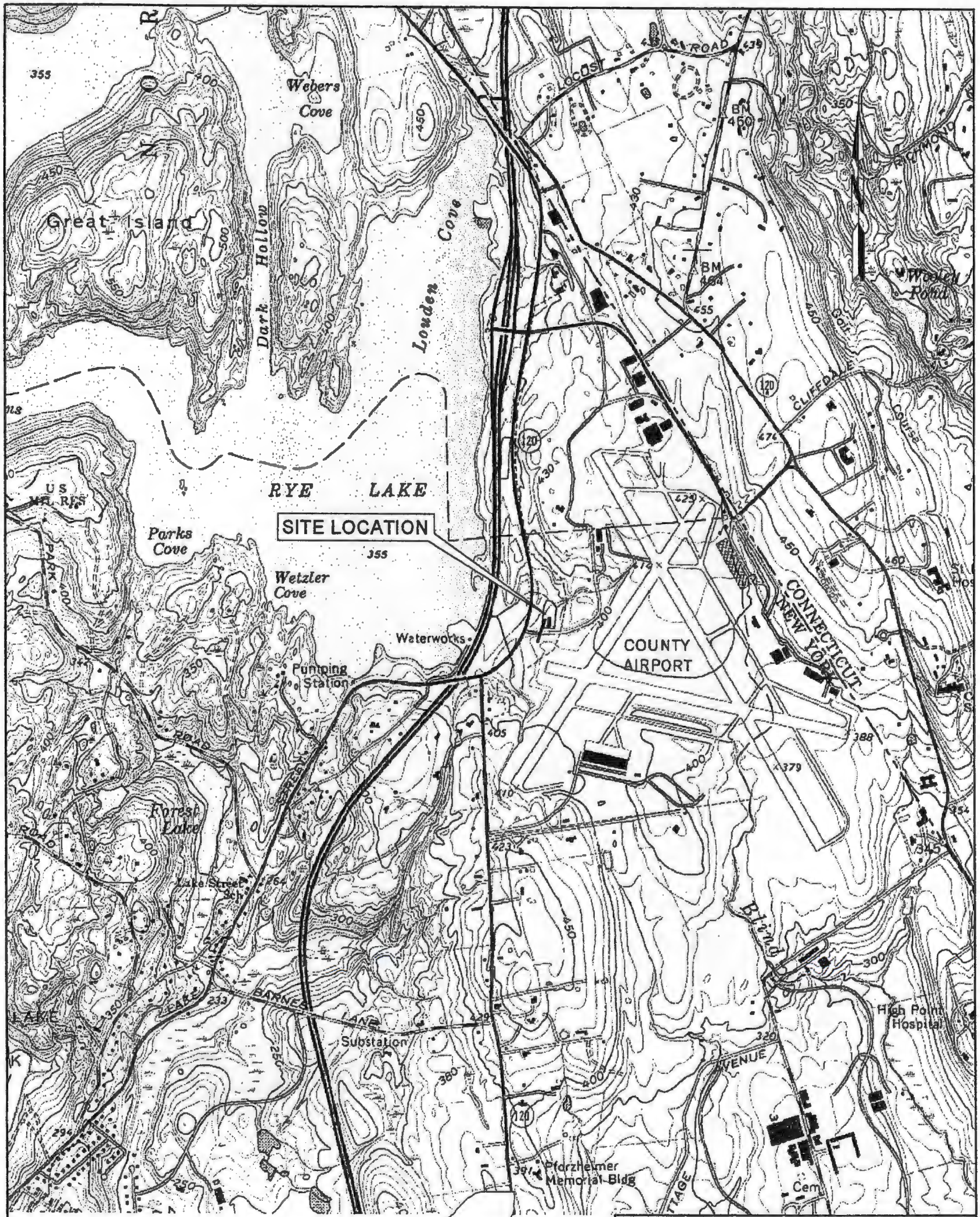
1.1 Background

This report presents the results of the first quarter post-closure sampling and monitoring conducted at the Harrison Subresidency site located in the town of Harrison, Westchester County, New York (Figure 1). The site, a seasonal highway maintenance support and salt storage facility operated by the New York State Department of Transportation (NYSDOT), includes approximately 2.6 acres of landfill area (Figure 2) that was recently regraded and capped in compliance with New York State Department of Environmental Conservation (NYSDEC) regulations. The first quarter sampling and monitoring was conducted to evaluate the environmental impacts of landfill closure through groundwater, surface water and sediment sampling, gas monitoring and a landfill inspection. The quarterly sampling and monitoring program was established to conform to the requirements of 6 NYCRR Part 360 2.15 (K).

1.2 Previous Sampling

Analytical results from filtered groundwater samples collected at all four on-site monitoring wells in October 1993 as part of the Preliminary Site Assessment (PSA) conducted by Lawler, Matusky & Skelly Engineers LLP (LMS), indicated that iron, manganese, and sodium exceeded New York State Class GA standards/guidance values. No volatile or semivolatile organic compounds were detected in the groundwater above the Class GA standards. Surface water sampling revealed that both the upgradient and downgradient surface waters exceeded Class A water quality standards for certain metals, including cadmium, aluminum, iron, and manganese. The sediment sample results indicated lead, chromium, manganese, and nickel concentrations above the NYSDEC sediment criteria in both the up and downgradient sampling locations.

In April 1998 LMS conducted pre-construction monitoring at the site to evaluate the conditions/impact of the landfill on groundwater, surface water, and surface water sediment at the site prior to construction of the landfill cap and to compare the results to those from the PSA. As part of this study, groundwater flow direction was determined to be from the southeast to the northwest within the area of the landfill. Filtered groundwater samples collected from the four



Map source: USGS 7.5 minute quadrangle map, Glenville Conn. NY, 1960 Photorevised 1971.

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Figure 1

Site Location

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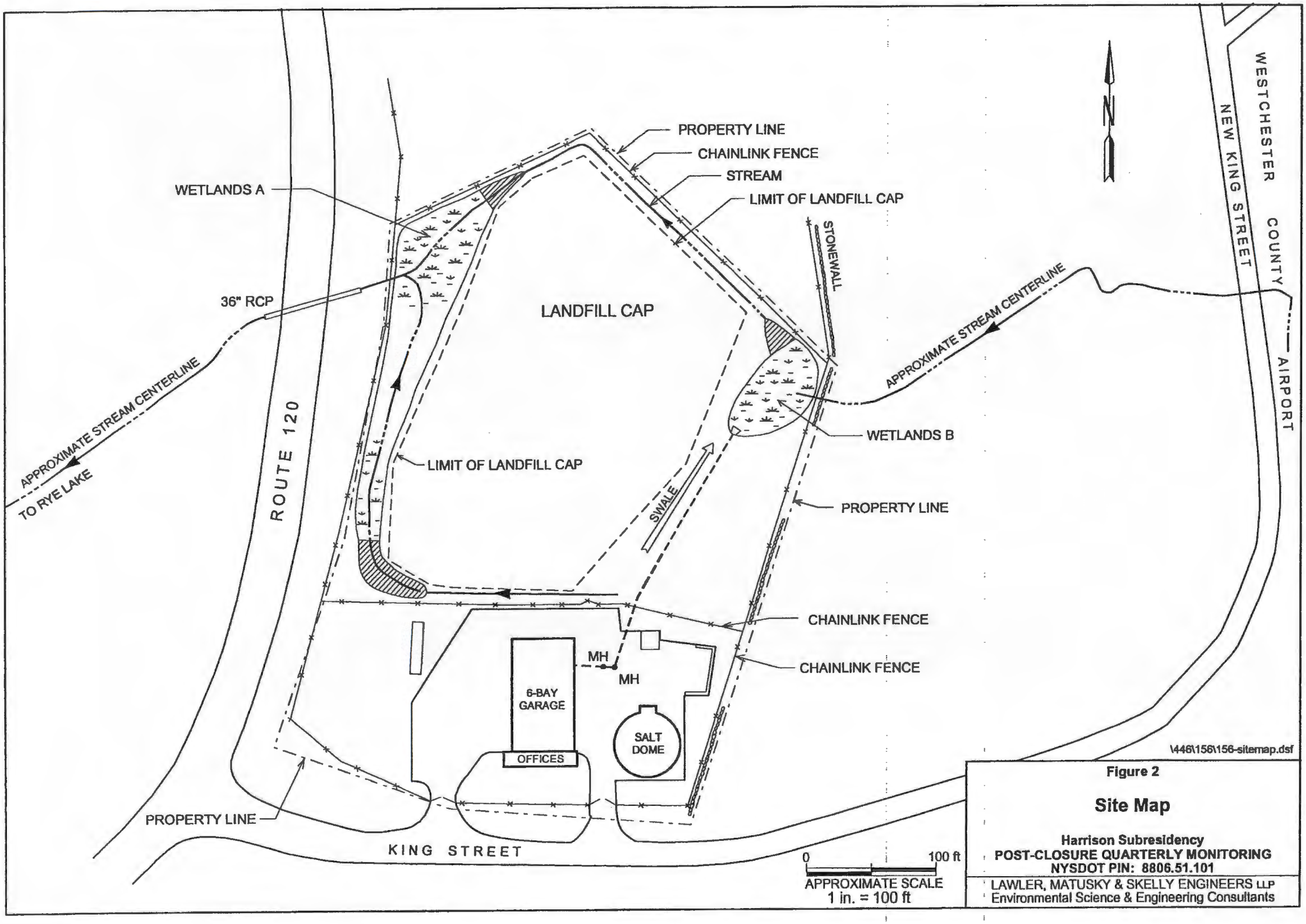

Figure 2

Site Map

Harrison Subresidency
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on-site monitoring wells (LMW-1, LMW-2, MW-3, and MW-4) and one filtered groundwater sample from an on-site shallow temporary well (GW-5) contained iron, manganese, and sodium above the New York State Class GA standards/guidance values. No volatile or semivolatile organic compounds were detected in the groundwater in excess of the Class GA standards. Surface water sampling revealed that both upgradient and downgradient surface waters exceeded Class A water quality standards for iron. The sediment sample results from SD-1 and SD-2 indicated cadmium, lead, and manganese concentrations above the New York State Department of Environmental Conservation (NYSDEC) sediment criteria.

In October 1998, LMS conducted monitoring during construction at the site to further evaluate the quality of the groundwater downgradient of the landfill, and to assess the conditions/impact of the landfill on the groundwater during the construction of the landfill cap and other remedial components such as the stream diversion. Analytical results of groundwater sampled from on-site wells (LMW-2, MW-4, PC-1, PC-2, PC-3, and PC-4) indicate that several metals (antimony, arsenic, barium, chromium, lead, nickel, and selenium) exceeded the Class GA standards, generally in the unfiltered samples.

In August 1999, LMS conducted monitoring at the site to provide information on post-closure groundwater, surface water and sediment quality and compare this information to pre-construction sampling data. Analytical results of groundwater sampled from both on-site and off-site wells (LMW-2, MW-4, PC-1, PC-2 and PC-3 and 4 respectively) indicate that several TAL metals (chromium, lead, copper, iron, manganese, magnesium, sodium and thallium) exceeded the Class GA standards, generally in the unfiltered samples. Iron, magnesium and sodium were also detected above the Class GA standards in one surface water sample (SW-1). Manganese was detected above the sediment criteria in two samples (SD-1 and SD-2). No VOCs, SVOCs or pesticides/PCBs were detected above their respective Class GA standard in the groundwater or surface water or above the sediment criteria. Chloride was detected above the Class GA standard in the unfiltered sample collected from the off-site well, PC-4. It was concluded that elevated levels of iron and manganese are being released to the groundwater downgradient of the landfill. The majority of the elevated concentrations of metals detected in the groundwater were associated with suspended particulates greater than 0.45 microns as was noted in the pre-construction sampling data.

1.2 Objective

The objectives of the post-closure sampling and monitoring program are to; 1) evaluate the environmental impacts of the landfill; 2) meet the post-closure monitoring requirements of the

NYSDEC and; 3) provide NYSDEC with data after one full year to evaluate and/or modify the existing sampling and monitoring program.

2.0 FIELD INVESTIGATION

2.1 Groundwater Investigation

Prior to the regrading and capping of the landfill there were four wells on site; one upgradient well (LMW-2), and three downgradient wells (LMW-1, MW-3, and MW-4). Both LMW-1 and MW-3 were removed during the regrading of the landfill. Four additional monitoring wells were installed as part of the October 1998 monitoring to allow for the continuation of groundwater monitoring downgradient of the landfill. PC-1 and PC-2 were located in the wetlands area at the base of the western toe of the landfill slope while PC-3 and PC-4 were located on New York City Department of Environmental Protection (NYSCDEP) property on the west side of Route 120 (Figure 3).

2.1.1 Monitoring Well Sampling

Six monitoring wells (LMW-2, MW-4, PC-1, PC-2, PC-3 and PC-4) were purged and sampled for Target Analyte List (TAL) metals and chloride from 25 October to 26 October 2000 as part of the post-closure sampling and monitoring program. LMW-2 went dry after purging 18 gallons and was allowed to recharge (to approximately 85%) before sampling. MW-4 was purged dry after 4 gallons and was allowed to recharge to approximately 80% before sampling. PC-1, PC-2, PC-3 and PC-4 were each purged of three well volumes prior to sampling. Purging of each well was performed by using either a small submersible pump, a peristaltic pump or by hand using a dedicated bailer. PC-2 was purged with a peristaltic pump because of a damaged casing (the well casing at PC-2 had sheared sideways allowing only a gap of about 2-cm down the well). After purging, samples were collected using dedicated disposable bailers. The samples were preserved on ice to 4°C and sent, under chain of custody, to a New York State Department of Health (NYSDOH)-approved laboratory for analysis.

Groundwater chemistry measurements (temperature, pH, conductivity, and turbidity) were recorded before, during, and after purging, with a measurement recorded for approximately every well volume (with the exception of MW-4). Static water level measurements were also taken prior to and after purging each well. Groundwater purging information is recorded on the well sampling forms presented in Attachment A.

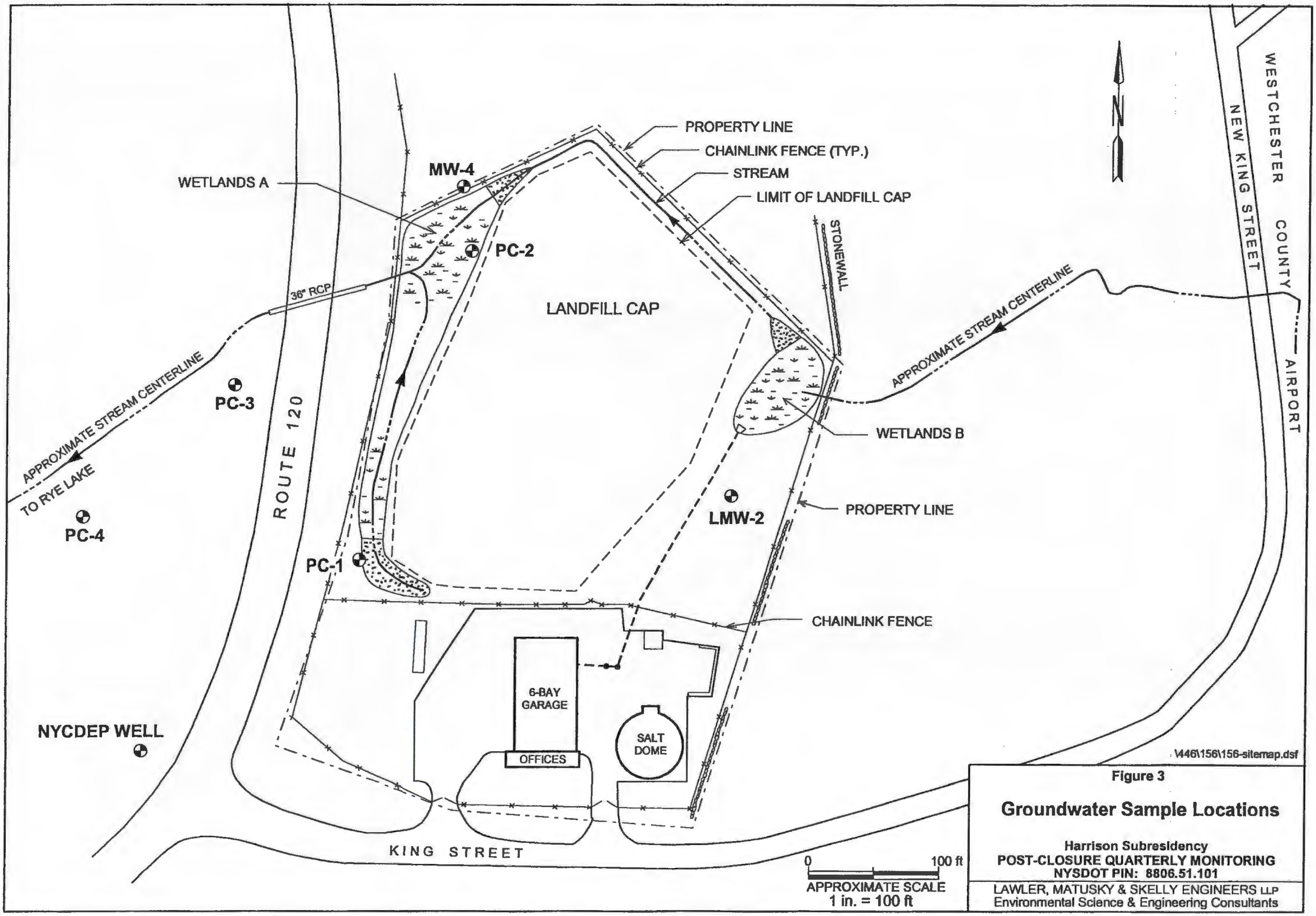

Figure 3

Groundwater Sample Locations

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2.2 Surface Water Sampling

On 24 October one upstream surface water sampling point (SW-1) and three downstream surface water sampling points (SW-2, SW-3 and SW-4) were located, staked and flagged (Figure 4). SW-1 was collected from a stream entering the eastern section of the landfill at wetlands B. The flow at SW-1 was very low (< 1 cfm) and limited to a small channel approximately 1 foot wide by 3 inches deep. SW-2, the downgradient portion of the stream, was located at the northern section of wetlands A (western side of the landfill). The flow at SW-2 was very low (<1 cfs) and limited to a small channel approximately 2 inches deep. SW-3 was located in the southern section of wetlands A at the western side of the landfill. The stream at this location was dry and no sample was collected. SW-4 was located approximately 17 feet north east of the 36-inch reinforced concrete pipe (RCP) culvert that diverts the stream southwest under Route 120 to Rye Lake. The flow at SW-4 was very low (< 1 cfs) and the stream was approximately 3 to 3.5 inches deep at this location. SW-1, SW-2 and SW-4 were sampled for TAL metals and chloride.

The surface water samples were collected by dipping a dedicated laboratory-cleaned stainless steel ladle into the water and transferring the sample to the appropriate laboratory-supplied container. The containers were iced to 4°C and sent, under chain of custody, to a NYSDOH-approved laboratory for analysis. Water chemistry measurements (temperature, pH, conductivity, and turbidity) were recorded during sample collection and are included in Attachment B.

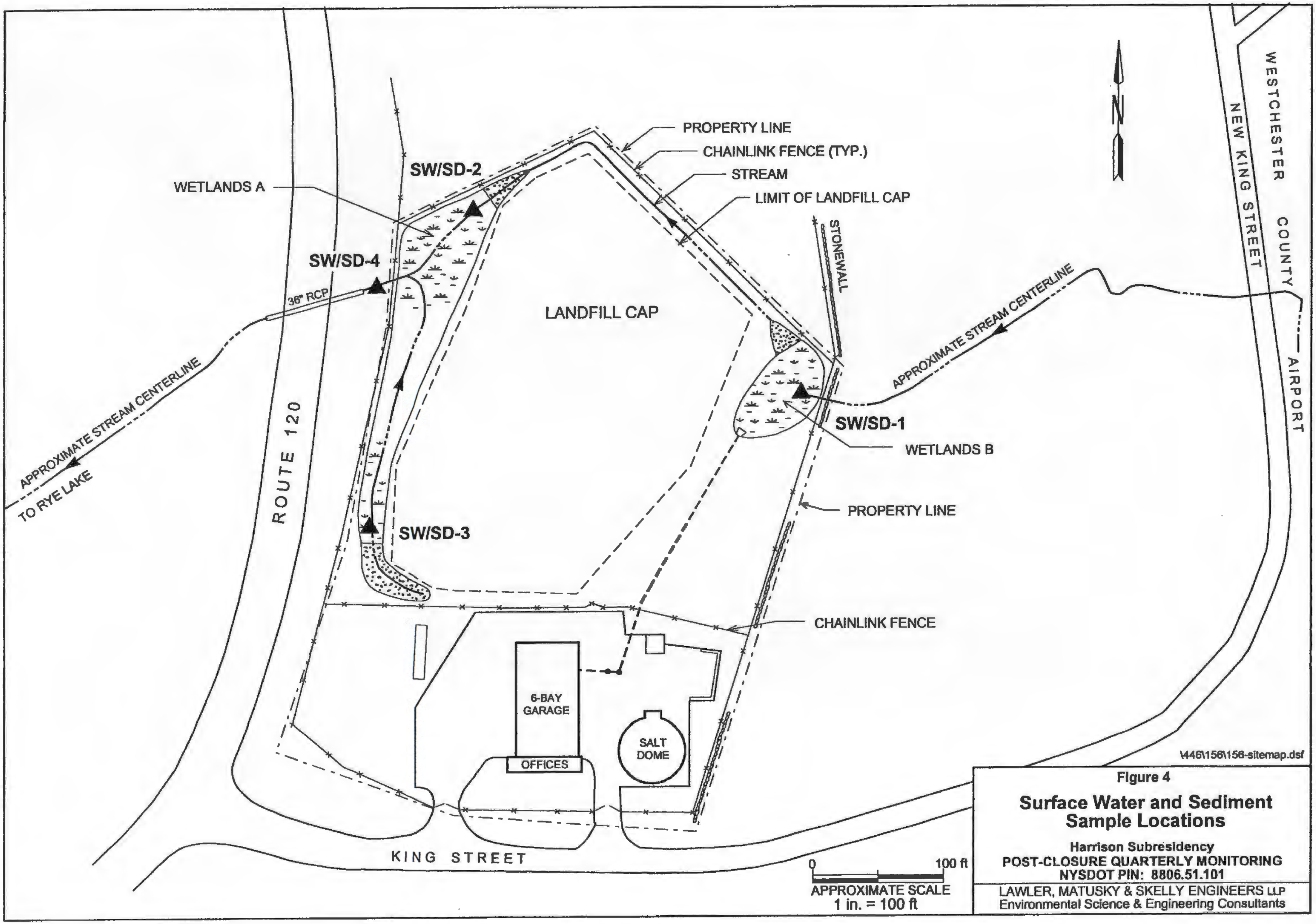

Figure 4

Surface Water and Sediment Sample Locations

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2.3 Sediment Sampling

Four sediment samples were collected for TAL metals and chloride analyses. Each sediment sample was collected subsequent to, and at the same location as, its corresponding surface water sample (Figure 4). Sediment samples were collected using a dedicated laboratory-cleaned stainless steel trowel and placed directly into the appropriate laboratory sample container. Each sample container was iced to 4°C and sent, under chain of custody, to a NYSDOH-approved laboratory for analysis. The sample depth, texture, color and odor were noted and are included in Attachment B.

2.4 Gas Monitoring

A gas monitoring program was instituted to verify that any gases, produced as a result of the natural decomposition of waste, do not pose a hazard to health or safety. The program includes the measurement of concentrations of methane or other explosive gases, hydrogen sulfide and volatile organic compounds (VOCs) at each of four gas vents and around the perimeter of the property line.

Methane and other explosive gases were measured with a combustible gas indicator (CGI) around the perimeter of landfill and gas vents. Gas vent readings were obtained by inserting the instrument detector probe into the vent. The CGI was set to sound an alarm if the readings exceeded 10 % of the lower explosive limit (LEL) of methane. In addition, alarms were set at 10% of the LEL of hydrogen sulfide, 25 parts per million (ppm) of carbon monoxide and 19.5% and 23.5% of oxygen. There were no readings above the preset alarm levels at the gas vents or the perimeter of the site.

VOCs were measured with a photoionization detector (PID) and a flame ionization detector (FID) (with and without the methane filter) at the perimeter of the site and each of the four gas vents. There were no readings, above background, at the vents or the perimeter of the site.

2.5 Inspections

All six groundwater monitoring wells were inspected and, with the exception of PC-2, were found to be good condition. As noted in Section 2.1.1 the well casing at PC-2 had sheared sideways allowing only a gap of about 2 cm down the well. The landfill was inspected and found to be in good condition. There were no signs of stressed vegetation, vermin or vector noted. The

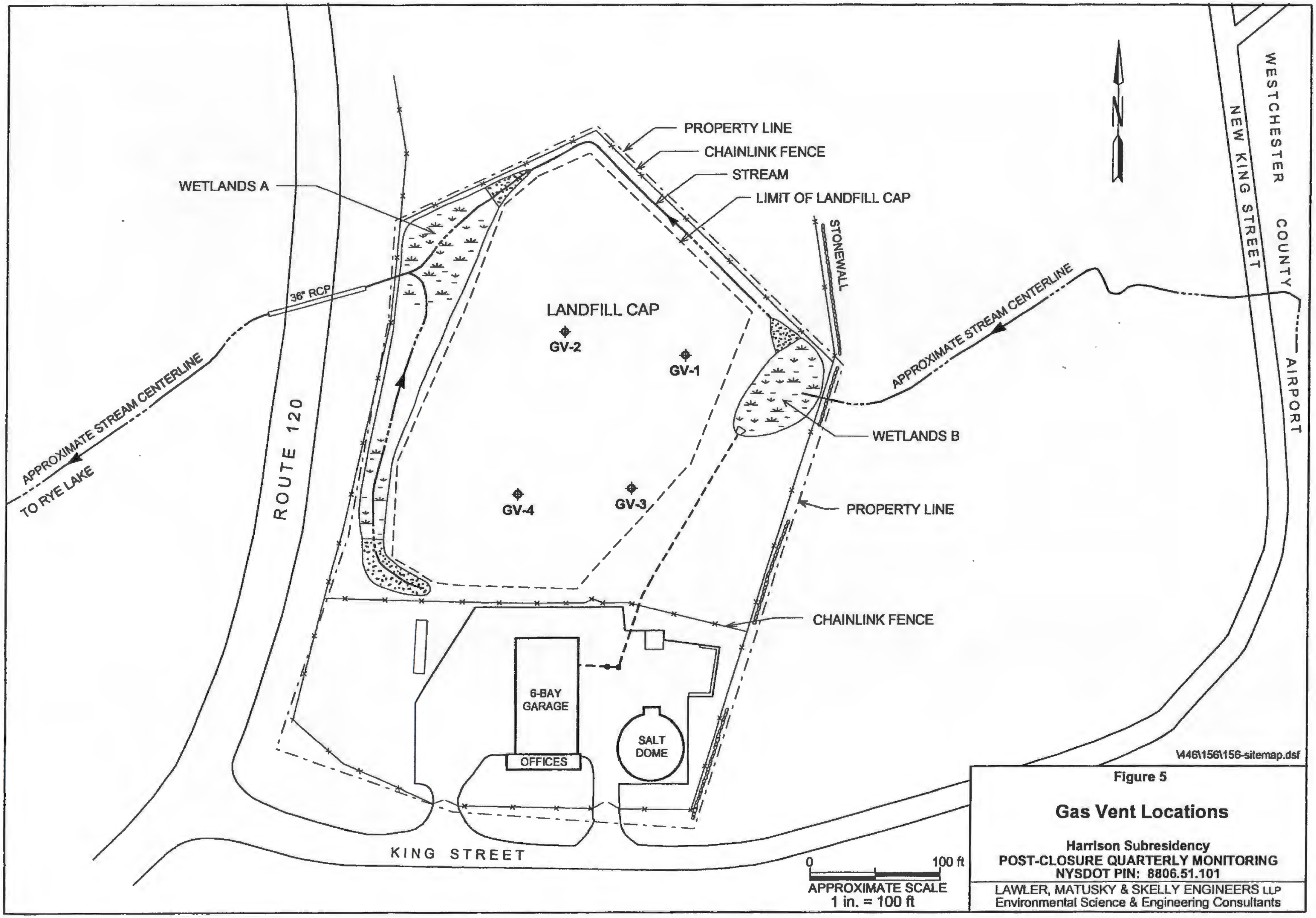

Figure 5

Gas Vent Locations

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drainage swales were inspected and found to be in good condition. All four gas vents were also inspected and were found to be in good condition.

2.6 Quality Assurance/Quality Control

An additional groundwater sample, PC-5, was collected to assess laboratory precision and accuracy. The sample was analyzed for TAL metals and chloride and the analytical results are included in Table 1. The relative percent difference (RPD) was calculated for each parameter that was detected in both the original and duplicate unfiltered samples. The results indicate that the RPD of one parameter (potassium) was greater than 50%. The RPD of the remaining parameters ranged from 14% to 38%. The analytical results are included in Table 2.

3.0 ANALYTICAL RESULTS

3.1 Groundwater Results

The six groundwater samples collected on 25 and 26 October 2000, designated as LMW-2, MW-4, PC-1, PC-2, PC-3, and PC-4, were analyzed for TAL metals, and chloride. Aliquots of these samples were also filtered (0.45-µm filter) for TAL metals analysis. Groundwater samples were analyzed according to NYSDEC Analytical Services Protocol (ASP). Analytical results for groundwater samples are presented in Table 1 and a copy of the analytical laboratory report is presented in Attachment D. Field parameters for temperature, pH, specific conductance, and turbidity are provided on the well sampling logs presented in Attachment A.

Results of the TAL metals analyses indicate that several metals were detected in the groundwater samples collected. In general, the results suggest that a large portion of the metals detected in the groundwater samples are associated with the solids fraction of the groundwater based on the filtered vs. unfiltered sample results. Concentrations of the metals detected in the groundwater are presented on Table 1.

Aluminum was detected in all the unfiltered groundwater samples. The concentrations range from 280 parts per billion (ppb) in the off-site well PC-3 to 110000 ppb in the on-site well PC-1. Aluminum was also detected in two filtered samples (MW-4 and PC-4 although at lower concentrations.

Arsenic was detected in the unfiltered sample collected from PC-1 at 18 ppb.

TABLE 1

GROUNDWATER SUMMARY
First Quarter (October 2000)
Harrison Subresidency Site
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PARAMETER	LMW-2	FIL LMW-2	MW-4	FIL MW-4	PC-1	FIL PC-1	PC-2	FIL PC-2	PC-3	FIL PC-3	PC-4	FIL PC-4	PC-5	FIL PC-5	NATURAL AMBIENT GROUNDWATER RANGES (n)	NYSDEC CLASS GA STANDARDS (a)
TAL METALS (ug/L)																
Aluminum	21000	ND	940	68	110000	ND	4400	ND	280	ND	8600	56	360	65	<5.0 - 1000	NS
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	3
Arsenic	ND	ND	ND	ND	18	ND	ND	ND	ND	ND	ND	ND	ND	ND	<1.0 - 30	25
Barium	520	160	190	110	1500	49	250	97	160	240	170	61	220	160	10 - 500	1000
Beryllium	ND	ND	2.6	ND	8.3	ND	3.3	ND	ND	ND	ND	ND	ND	ND	<10	3.0 GV
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<1.0	5
Calcium	100000	100000	72000	71000	72000	37000	67000	6000	85000	140000	25000	22000	120000	91000	1000 - 150000	NS
Chromium	48	ND	ND	ND	240	ND	ND	ND	ND	ND	35	ND	ND	ND	<1.0 - 5.0	50
Cobalt	23	ND	13	14	80	ND	5.6	ND	ND	ND	7.5	ND	ND	ND	<10	NS
Copper	54	ND	ND	ND	260	ND	ND	ND	ND	ND	22	ND	ND	ND	<1.0 - 3	200
Iron	37000	ND	83000	33000	190000	77	86000	25000	2900	2000	32000	ND	3800	ND	10 - 10000	300 (m)
Lead	9	ND	6.5	ND	64	ND	9.6	ND	ND	ND	8.7	ND	ND	ND	<15	25
Magnesium	45000	37000	21000	21000	63000	7100	22000	19000	23000	35000	11000	7400	31000	24000	1000 - 50000	35000 GV
Manganese	5600	1200	34000	28000	16000	890	14000	13000	1100	1200	170	22	1300	1200	<1.0 - 1000	300 (m)
Mercury	ND	ND	ND	ND	0.19	ND	ND	ND	ND	ND	ND	ND	2.1	1.9	<1.0	0.7
Nickel	68	13	ND	ND	190	ND	ND	ND	ND	ND	30	ND	ND	ND	<10 - 50	100
Potassium	17000	6600	4000	3900	47000	3200	5400	4200	5400	7900	5800	4000	7300	5900	1000 - 10000	NS
Selenium	ND	ND	22	17	27	ND	16	ND	ND	ND	ND	ND	ND	ND	<1.0 - 10	10
Silver	6.8	ND	ND	ND	21	ND	ND	ND	ND	ND	ND	ND	ND	ND	<5	50
Sodium	47000	50000	34000	33000	120000	120000	60000	56000	97000	130000	43000	41000	130000	110000	500 - 120000	20000
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A	0.5 GV
Vanadium	72	4.8	17	5.3	410	ND	30	5.1	3.6	4.9	41	ND	5.3	3.5	<1.0 - 10	NS
Zinc	120	23	18	19	490	22	46	23	20	44	61	28	23	38	<10 - 2000	2000 GV
Chloride (mg/L)	*	33	*	52	*	47	*	68	*	320	*	68	*	320	N/A	250

a - NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1). June 1998, revised April 2000.
GV - Guidance value.
(m) - Sum of Iron and Manganese not to exceed 500 ug/L.
(n) - Dragun, J., The Soil Chemistry of Hazardous Materials.
N/A - Not applicable.
ND - Not detected at analytical detection limit.
NS - No standard.
* - Not analyzed.

Barium was detected in both the unfiltered and filtered samples collected from all six wells. The concentrations detected in the unfiltered samples range from 160 ppb in the offsite well PC-3 to 1500 ppb in the sample collected from PC-1. With the exception of PC-3, the concentrations detected in the filtered samples are lower than those detected in the unfiltered samples.

Beryllium was detected in the unfiltered samples collected from MW-4 (2.6 ppb), PC-1 (8.3 ppb) and PC-2 (3.3 ppb). Beryllium was not detected in the associated filtered samples collected from these wells.

Calcium was detected in all the unfiltered and filtered samples. The concentrations range from 25000 ppb (PC-4) to 100000 ppb (LMW-2) in the unfiltered samples. With the exception of the sample collected from the off-site well PC-3, the concentrations of calcium detected in the filtered samples were the lower or the same as those detected in the unfiltered samples.

Chromium was detected in three unfiltered samples collected from the upgradient sample LMW-2 (48 ppb), PC-1 (240 ppb) and PC-4 (35 ppb). Chromium was not detected in any of the filtered samples.

Cobalt was detected in the unfiltered samples collected from LMW-2, MW-4, PC-1, PC-2 and PC-4 with concentrations ranging from 5.6 ppb in the sample collected from the on-site well PC-2 to 80 ppb in the sample collected from PC-1. Cobalt was also detected in the filtered sample collected from MW-4 at 14 ppb.

Copper was detected in the unfiltered samples collected from LMW-2 (54 ppb), PC-1 (260 ppb) and PC-4 (22 ppb). Copper was not detected in any of the filtered samples.

Iron was detected in the unfiltered samples collected from all six wells. The concentrations range from 2900 ppb in PC-3 to 190000 ppb in the on-site well PC-1. Iron was also detected in several filtered samples (MW-4, PC-1, PC-2 and PC-3) although at lower concentrations than detected in the unfiltered samples.

Lead was detected in five unfiltered samples collected from LMW-1 (9 ppb), MW-4 (6.5 ppb) PC-1 (64 ppb), PC-2 (9.6 ppb) and PC-4 (87 ppb). Lead was not detected in any of the filtered samples.

Magnesium was detected in both the filtered and unfiltered samples collected from all six wells. The concentrations range from 7100 ppb in the filtered sample collected from PC-1 to 63000 ppb in the unfiltered sample collected from PC-1. With the exception of the concentration of magnesium detected PC-3, all the concentrations detected in the filtered samples were either lower, or the same as, the concentrations detected in the unfiltered samples.

Manganese was detected in both the filtered and unfiltered samples collected from all six wells. The highest concentration was detected in unfiltered sample collected from the on-site well MW-4 at 34000 ppb. The lowest concentration, 22 ppb, was detected in the filtered sample collected from PC-4. With the exception of the concentration of manganese detected in PC-3, all the concentrations of manganese, detected in the filtered samples, were lower than the concentrations detected in the unfiltered samples.

Mercury was detected in the unfiltered sample collected from PC-1 at 0.19 ppb.

Nickel was detected in the unfiltered samples collected from LMW-2, PC-1 and PC-4 in concentrations that range from 30 ppb in the sample collected from PC-4 to 190 ppb in the sample collected from PC-1. With the exception of the concentration of nickel detected in the filtered sample collected from the upgradient well LMW-2, nickel was not detected in the filtered samples.

Potassium was detected in both the filtered and unfiltered samples collected from all six wells. The concentrations range from 4000 ppb (MW-4) to 47000 ppb (PC-1) in the unfiltered samples. With the exception of the concentration of potassium detected in the filtered sample collected from PC-3, the concentrations of potassium detected in the filtered samples were lower than the concentrations detected in the unfiltered samples.

Selenium was detected in both the filtered and unfiltered samples collected from MW-4 at 17 ppb and 22 ppb respectively and in the unfiltered samples PC-1 (27 ppb) and PC-2 (16 ppb).

Silver was detected in the two unfiltered samples LMW-2 (6.8 ppb) and PC-1 (21 ppb).

Sodium was detected in both the filtered and unfiltered samples collected from all six wells. The concentrations range from 33000 ppb in the filtered sample collected from MW-4 to 130000 ppb in the filtered sample collected from the off-site well PC-3. In general, the concentrations of sodium detected in the filtered samples were lower than those detected in the unfiltered samples.

Vanadium was detected in all the unfiltered samples and four of the filtered samples collected from the six wells .The concentrations detected in the unfiltered samples range from 306 ppb in

PC-3 to 410 ppb in PC-1. With the exception of PC-3, the concentrations detected in the filtered samples are lower than those detected in the unfiltered samples.

Zinc was detected in all the unfiltered and filtered samples collected from all six wells. The highest concentration, 490 ppb, was detected in the unfiltered sample collected from PC-1. The lowest concentration of zinc (18 ppb) was detected in the unfiltered sample collected from MW-4. In general, the zinc concentrations detected in the filtered samples are lower than those detected in the unfiltered samples.

Chloride was detected in the filtered samples collected from all six wells. The concentrations range from 33 ppm in the sample collected from LMW-2 to 320 ppm in the sample collected from the off-site well PC-3.

The filtered and unfiltered analytical results suggest that, with some exceptions, a large portion of the TAL metals, detected in the samples, are associated with the suspended solids portion of the groundwater. Field-measured groundwater turbidities were as high as 350 nephelometric turbidity units in the groundwater samples. Turbidity data is included in the well sampling logs located in Attachment A. Concentrations of the metals detected in the groundwater are presented on Table 1.

3.2 Surface Water Results

Three surface water samples collected 24 October 2000 and designated as SW-1, SW-2 and SW-4 were analyzed for TAL and chloride. Surface water samples were analyzed according to NYSDEC ASP. Analytical results for surface water samples are presented in Table 2, and a copy of the analytical laboratory report is presented in Attachment D. Field parameters for temperature, pH, specific conductance, and turbidity are provided on the field sampling data sheets presented in Attachment B.

Results of the TAL metals analyses indicate that sixteen metals were detected in the surface water samples. Concentrations of TAL metals detected in the surface water are presented on Table 2.

Aluminum was detected in all three unfiltered samples. There were no concentrations of aluminum detected in any of the filtered samples or in the filtered and unfiltered duplicate sample SW-5.

TABLE 2

SURFACE WATER SUMMARY

First Quarter (October 2000)

Harrison Subresidency
NYSDOT
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PARAMETER	SW-1	FIL SW-1	SW-2	FIL SW-2	SW-4	FIL SW-4	NATURAL AMBIENT GROUNDWATER RANGES (n)	NYSDEC CLASS GA STANDARDS (a)
TAL METALS (ug/L)								
Aluminum	520	ND	820	ND	740	ND	<5.0 - 1000	NS
Antimony	ND	ND	ND	2.1	2.5	ND	N/A	3
Arsenic	ND	ND	ND	ND	ND	ND	<1.0 - 30	25
Barium	53	33	53	32	62	32	10 - 500	1000
Beryllium	ND	ND	ND	ND	ND	ND	<10	3.0 GV
Cadmium	ND	ND	ND	ND	ND	ND	<1.0	5
Calcium	56000	47000	55000	46000	51000	44000	1000 - 150000	NS
Chromium	170	ND	ND	ND	15	ND	<1.0 - 5.0	50
Cobalt	ND	ND	ND	ND	ND	ND	<10	NS
Copper	ND	ND	ND	ND	ND	ND	<1.0 - 3	200
Iron	2200	ND	2200	ND	9000	ND	10 - 10000	300 (m)
Lead	ND	ND	5.1	ND	5.7	ND	<15	25
Magnesium	18000	15000	17000	14000	15000	13000	1000 - 50000	35000 GV
Manganese	380	65	600	8.3	730	150	<1.0 - 1000	300 (m)
Mercury	0.25	0.22	0.16	0.23	0.41	0.15	<1.0	0.7
Nickel	ND	ND	ND	ND	9.1	ND	<10 - 50	100
Potassium	5300	4100	4600	3900	4000	3400	1000 - 10000	NS
Selenium	ND	ND	9.7	ND	ND	ND	<1.0 - 10	10
Silver	ND	ND	ND	ND	ND	ND	<5	50
Sodium	51000	40000	25000	23000	26000	23000	500 - 120000	20000
Thallium	ND	ND	ND	ND	ND	ND	N/A	0.5 GV
Vanadium	6	3.5	6.5	ND	7.5	ND	<1.0 - 10	NS
Zinc	19	ND	17	ND	ND	ND	<10 - 2000	2000 GV
Chloride (mg/L)	*	54	*	42	*	26	N/A	250

a - NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1). June 1998, revised April 2000.
GV - Guidance value.
n - Dragun, J., The Soil Chemistry of Hazardous Materials.
N/A - Not applicable.
ND - Not detected at analytical detection limit.
NS - No standard.
* - Not analyzed.

Antimony was detected in the filtered sample collected from SW-2 (2.1 ppb) and the unfiltered sample collected from SW-4 (2.5 ppb).

Barium was detected in both the unfiltered and filtered samples collected the surface water sampling points. The concentrations range from 53 ppb in the unfiltered samples collected from SW-1 and SW-2 to 62 ppb from the unfiltered sample collected from SW-4. The concentrations of barium detected in the filtered samples are lower than those detected in the unfiltered samples.

Calcium was detected in both the unfiltered and filtered samples collected from SW-1, SW-2 and SW-4 at 56000 ppb/47000 ppb, 55000 ppb/46000 ppb, and 51000 ppb/44000 ppb respectively.

Chromium was detected in the unfiltered samples SW-1 (170 ppb) and SW-4 (15 ppb).

Iron was detected in the unfiltered samples collected from each sampling point. The concentrations range from 2200 ppb in SW-1 and SW-2 to 9000 ppb in SW-4. Iron was not detected in the associated filtered samples.

Lead was detected in the unfiltered samples collected from SW-2 (5.1 ppb) and SW-4 (5.7 ppb). Lead was not detected in the associated filtered samples.

Magnesium was detected in both the unfiltered and filtered samples collected from SW-1, SW-2 and SW-4 at 18000 ppb/15000 ppb, 17000 ppb/14000 ppb and 15000 ppb/13000 ppb respectively.

Manganese was detected in both the unfiltered and filtered samples collected from SW-1, SW-2 and SW-4 at 380 ppb/65 ppb, 600 ppb/8.3 ppb and 730 ppb/150 ppb respectively.

Mercury was detected in both the unfiltered and filtered samples collected from SW-1, SW-2 and SW-4 at 0.25 ppb/0.22 ppb, 0.16 ppb/0.23 ppb and 0.41ppb/0.15 ppb respectively.

Nickel was detected in the unfiltered sample collected from SW-4 at 9.1 ppb. Nickel was not detected in the associated filtered sample.

Potassium was detected in both the unfiltered and filtered samples collected from SW-1, SW-2 and SW-4 at 5300 ppb/ 4100 ppb, 4600 ppb/3900 ppb and 4000 ppb/3400 ppb respectively.

Selenium was detected in the unfiltered samples collected from SW-2 at 9.7 ppb. Selenium was not detected in the associated filtered sample.

Sodium was detected in both the unfiltered and filtered samples collected from SW-1, SW-2 and SW-4 at 51000 ppb/40000 ppb, 25000 ppb/23000 ppb and 26000 ppb/23000 ppb respectively.

Vanadium was detected in the unfiltered and filtered samples collected from SW-1 (6 ppb/3.5 ppb), The unfiltered sample collected from SW-2 (6.5 ppb) and the unfiltered sample collected from SW-4 (7.5 ppb).

Zinc was detected in the unfiltered samples collected from SW-1 (19 ppb) and SW-2 (17 ppb). Zinc was not detected in the associated filtered samples.

Chloride was detected in all three samples at concentrations ranging from 26 ppm (SW-4) to 54 ppm (SW-1).

3.3 Sediment Data Results

Four sediment samples collected on 24 October 2000, designated as SD-1, SD-2, SD-3 and SD-4, were analyzed for TAL and chloride. Sediment samples were analyzed according to NYSDEC ASP. Analytical results for sediment samples are presented in Table 3, and a copy of the analytical laboratory report is presented in Attachment D. Sample depths and field observations are provided on the sediment sampling logs included in Attachment B.

Results of the TAL metals analyses indicate that seventeen metals were detected in the sediment samples collected. Concentrations of the metals detected in the sediment samples are presented on Table 3.

Aluminum was detected in all four samples and the concentrations range from 3300 ppm (SD-4) to 6100 ppm in the upgradient sample (SD-1). Arsenic was detected in all four samples. The highest concentration, 3.2 ppm was detected in SD-4. The highest concentration of barium was detected in SD-2 at 46 ppm. Calcium was detected in all four samples and the concentrations range from 2500 ppm in SD-1 to 68000 ppm in SD-4. The highest concentration of chromium, 11 ppm was detected in the upgradient sample SD-1. Cobalt was detected in all four samples. The highest concentration, 4.6 ppm was detected in SD-4. The highest concentration of copper (15 ppm) was detected in the upgradient sample SD-1. Iron was detected in all four samples. The concentrations range from 11000 ppm in SD-1 and SD-3 to 13000 ppm in SD-2 and SD-4.

TABLE 3

SEDIMENT DATA SUMMARY
First Quarter (October 2000)
Harrison Subresidency
NYSDOT

D008873, PIN 8806.51.101

PARAMETER	SD-1	SD-2	SD-3	SD-4	Sediment Criteria (a)	
					LEL[1]	SEL[2]
	[DL 1:100]	[DL 1:100]	[DL 1:100]	[DL 1:100]		
TAL METALS (mg/kg)						
Aluminum	6100	5600	5400	3300		
Antimony	ND	ND	ND	ND	2	25
Arsenic	1.5	3	2.4	3.2	6	33
Barium	38	46	26	26		
Beryllium	ND	ND	ND	ND		
Cadmium	ND	ND	ND	ND	0.6	9
Calcium	2500	46000	52000	68000		
Chromium	11	9.7	7.9	3.9	26	110
Cobalt	3.9	3.7	3.2	4.6		
Copper	15	11	14	10	16	110
Iron	11000	13000	11000	13000	20000	40000
Lead	11	25	92	11	31.0	110
Magnesium	2900	17000	28000	37000		
Manganese	240	360	200	690	460	1100
Mercury [DL 1:167]	ND	ND	ND	ND	0.15	1.3
Nickel	7.6	9.5	7.5	7.5	16	50
Potassium	1100	1400	1200	930		
Selenium	1.6	1.2	1.2	1.5		
Silver	1.1	0.52	0.43	ND	1	2.2
Sodium	ND	ND	ND	ND		
Thallium	ND	ND	ND	ND		
Vanadium	19	18	16	10		
Zinc	48	38	44	26	120	270
Chloride (mg/kg)	140	ND	ND	ND		

(a) - NYSDEC Technical Guidance for Screening Contaminated Sediments. January 1999 revision.
1 - Lowest Effect Level
2 - Severe Effect Level
DL - Dilution factor.
ND - Not detected at analytical detection limit.

The highest concentration of lead (92 ppm) was detected in SD-3. Magnesium was detected in all four samples. The concentrations range from 17000 ppm (SD-2) to 37000 ppm (SD-4). The highest concentration of manganese (690 ppm) was detected in SD-4. Nickel was detected in all four samples. The highest concentration (9.5 ppm) was detected in SD-2. Potassium was detected in all four samples and the concentrations range from 930 ppm (SD-4) to 1400 ppm (SD-2). The highest concentrations of selenium and silver (1.6 ppm and 1.1 ppm respectively) were detected in the upgradient sample SD-1. Vanadium was detected in all four samples and the concentrations range from 10 ppm (SD-4) to 19 ppm in the upgradient sample (SD-1). The highest concentration of zinc was also detected in the upgradient sample SD-1 at 48 ppm.

Chloride was detected at 140 ppm in the upgradient sample SD-1. Chloride was not detected in any of the downgradient samples

4.0 COMPARISON TO APPLICABLE CRITERIA

4.1 Groundwater

The results of the groundwater analyses were compared to current NYSDEC Ambient Water Quality Class GA Standards and Guidance Values (April 2000 revision).

The results of the TAL metals analyses indicate that ten metals, detected in the unfiltered samples, and six metals, detected in the filtered samples, occurred at concentrations exceeding their representative groundwater criteria (Table 1). As discussed earlier (3.1), the higher metals concentrations generally appear to be primarily associated with the suspended solids portion of the groundwater.

Beryllium, detected in the unfiltered samples, PC-1 (8.3 ppb) and PC-2 (3.3 ppb), exceeded the Class GA guidance value of 3 ppb. However, beryllium was not detected in the corresponding filtered samples from these wells. Chromium, detected in the unfiltered sample PC-1 at 240 ppb exceeded the Class GA standard of 50 ppb. Chromium was not detected in the associated filtered sample collected from this well. Copper exceeded the Class GA standard of 200 ppb in the sample collected from PC-1 (260 ppm). However, copper was not detected in the associated filtered sample collected from this well. Iron and manganese exceeded the combined Class GA standard of 500 ppm in all the unfiltered samples and in three filtered samples. However, all the concentrations of iron and manganese detected in the corresponding filtered samples were lower than those detected in the unfiltered samples. Magnesium, detected in the filtered and unfiltered samples collected from the upgradient well LMW-2 and the unfiltered sample collected from

PC-1, exceed the Class GA guidance value of 35000 ppb. The Class GA standard for nickel (100 ppb) was exceeded in the unfiltered sample collected from PC-1 (190 ppb). Nickel was not detected in the associated filtered sample collected from this well. Selenium exceeded the Class GA standard of 10 ppb in both the unfiltered and filtered samples collected from MW-4 and the unfiltered samples collected from PC-1 and PC-2. Selenium was not detected in the associated filtered samples collected from PC-1 and PC-2 and was detected at a lower concentration in the filtered sample collected from MW-4. Sodium exceeded the standard of 20,000 ppb in all filtered and unfiltered samples. The concentrations detected in the filtered samples were generally lower than those detected in the unfiltered samples.

Chloride was detected above the Class GA standard of 250 ppm in the filtered sample collected from PC-3 at 330 ppm.

4.2 Surface Water

The results of the surface water analyses were compared to current NYSDEC Ambient Water Quality Class GA Standards and Guidance Values (April 2000 revision).

The results of the TAL metals analyses indicate that four metals, detected in the surface water samples occurred at concentrations exceeding their respective criteria (Table 2). Chromium was detected above the Class GA standard of 50 ppb in the upstream surface water sample SW-1 at 170 ppb. However, chromium was not detected in the associated filtered sample. The presence of chromium, in this concentration, in the upstream sample suggests and off-site source. Iron and manganese exceeded the combined Class GA standard of 500 ppb in all three unfiltered samples. Iron and manganese did not exceed the combined Class GA standard in the associated filtered samples. Sodium exceeded the standard of 20,000 ppb in both the unfiltered and filtered samples collected from all three sampling locations. However, the concentrations detected in the associated filtered samples were lower than those detected in the unfiltered samples. The highest concentration of sodium was detected in the upstream sample SW-1 which suggests an additional off-site source.

There was no detection of chloride above the Class GA standard of 250 ppm detected in the surface water samples.

4.3 Sediment

The results of the sediment analyses (Table 3) were compared to current NYSDEC Technical Guidance for Screening Contaminated Sediment (January 1999 revision).

The results of the TAL metals analyses indicate that lead, manganese and silver exceeded the lowest effect level (LEL) sediment criteria. Silver was detected above the LEL of 1 ppm in the upgradient sample SD-1. This suggests an off-site source. Lead was detected above the LEL of 31 ppm in SD-3 at 92 ppm. Manganese was detected above the LEL of 460 ppm in SD-4 at 690 ppm. There were no other exceedences, detected in the sediment samples, that exceeded the LEL or SEL sediment criteria.

6.0 CONCLUSIONS

Groundwater samples taken downgradient of the landfill indicate that the landfill is releasing, and/or mobilizing from the soil, elevated levels of iron and manganese (neither of which are hazardous or RCRA constituents). Results from the filtered and unfiltered groundwater samples indicate, as they did in August 1999, that the majority of metals detected in the groundwater samples are associated with suspended particulates greater than 0.45 µm in size. The results indicate that concentrations of several TAL metals detected in the unfiltered sample from the upgradient well LWM-2, exceeded the concentrations detected in the unfiltered samples collected from downgradient wells, suggesting an off-site source. Elevated levels of sodium in both the filtered and unfiltered samples collected from all six wells may be related to the salt dome south of the landfill or runoff from Rt.120. The metals detected in the surface water were also detected in the groundwater. The highest concentration of sodium was detected in the upstream sample SW-1 which suggests an additional off-site source for this metal. As with the groundwater samples, the majority of metals detected in the surface water samples are associated with suspended particulates greater than 0.45 µm in size. Three metals were detected above the LEL in the sediment samples. The upgradient sample, SD-1 had the highest concentration of silver which suggests an off-site source for this metal in the sediment. Silver was not detected in the corresponding surface water sample collected at this location. Lead and manganese were detected, above the LEL, in two downgradient sediment samples. Lead was detected above the LEL but below the SEL, in SD-3. However, lead was not detected above the Class GA standard in the upstream or downstream surface water samples. Manganese was detected above the LEL in SD-4. It was also detected above the Class GA standard in the surface water and groundwater. However, manganese is not hazardous or a RCRA constituent.