FPM group — Engineering and Environmental Science

FPM Group, Ltd.
FPM Engineering Group, P.C.
formerly Fanning, Phillips and Molnar

CORPORATE HEADQUARTERS
909 Marconi Avenue
Ronkonkoma, NY 11779
631/737-6200
Fax 631/737-2410

VIA EMAIL

March 28, 2018

Mr. Alex Arker, General Partner
Peninsula Rockaway Limited Partnership
C/o The Arker Companies
15 Verbena Avenue, #100
Floral Park, NY 11001

Re: **Phase II Investigation Report**
Queens Block 15857, Lot 1
51-17 Rockaway Beach Boulevard, Far Rockaway, New York
FPM File No. 1214g-17-08

Dear Alex:

FPM Group (FPM) has prepared this report to document Phase II investigation conducted at the above-referenced subject property on February 23 and 28, 2018 in accordance with our March 13, 2017 proposal. The Phase II investigation included a geophysical survey to identify potential subsurface structures and utilities, and soil, groundwater, and soil vapor sampling to evaluate subsurface conditions.

The scope of work was developed based on the historic information for the property, including its usage as a paint and chemical company as well as other unspecified warehouse/industrial purposes. The investigation procedures and results are described below.

Phase II Investigation Procedures and Results

Geophysical Survey

A geophysical survey was conducted on the accessible portions of the property to locate subsurface obstructions that may be present, including underground storage tanks (USTs), drainage structures, and/or underground utilities. The results of this survey were marked on the ground for use during the investigation to evaluate and sample select structures and areas. The structures identified during the geophysical survey are shown on the attached Figure 1.

Five suspected catch basins were noted on the property and are identified on Figure 1 as CB-1 through CB-5. Each of these structures was noted to have a solid bottom ranging in depth from 1 to 3 feet below grade. Sediments were present in each of the structures and, in most cases, the structures were filled to grade. Catch basins CB-1 through CB-3 were observed to be connected in sequence and the piping appears to lead toward one of the suspected sewer pits on the northwest corner of the property. The pipe connected to CB-1 also appeared to lead toward the east; however, the detected signal ended just before the property boundary. No pipes were observed within CB-4 and CB-5 and it is not clear whether piping was previously present.

Three shallow solid-bottom square pits were observed on the northwest corner of the property; these features may have formerly served as sewer connections or cleanouts.

Two drywells that appear to discharge to the subsurface were observed; one is located on the northwest portion of the property and one is located on the west-central portion of the property. No inlet or outlet pipes were observed inside these structures.

Soil Sampling - Observations

Soil sampling was performed to assess soil conditions at the property. Sampling methods included soil borings through the property surface (B1, B2, and B5 through B10), soil borings through the drywells (B3 and B4), and sediment sampling in one catch basin (CB-2). With the exception of boring B8, all of the soil borings through the property surface included penetrating a concrete slab from the former onsite buildings. At B8 the soil boring was conducted through pavers set in concrete.

At the boring locations, soil was continuously sampled using a direct push rig at each location, with the borings generally extending to a depth of 10 feet below grade. In the case of boring B9, the boring was extended to 15 feet below grade so as to evaluate the vertical extent of contamination. The soil from each boring was visually examined by an environmental professional and screened for organic vapors with a calibrated photoionization detector (PID). The observations were recorded on boring logs, copies of which are included in Attachment A.

Soils from just beneath the concrete slab or pavers generally included historic fill composed of a gray/black fine to medium-grained sand containing angular gravel, slag, brick, and concrete to about 3 feet below grade. The historic fill is underlain by dark brown/gray-black fine to medium-grained sand with organics, gravel, and silt generally from 3 to 7 feet below grade. Soils from 7 feet below grade and deeper generally consist of gray fine to medium grained sand. Groundwater was typically encountered at 5 feet below grade.

No PID responses, staining, odors, sheen, or other indications of potential contaminant releases were observed in the materials encountered in any of the borings, with the exception of boring B9. At boring B9, odors that appeared consistent with paint and petroleum were noted from 1 to 11feet below grade; organic vapors were detected throughout this interval with a maximum PID response of 1,240 parts per million (ppm) detected at 5 feet below grade. Organic vapor concentrations decreased with depth and no significant PID response was noted below 11 feet.

Soil Sampling – Test Results and Discussion

A sample of the historic fill was retained from each of the borings, generally from 1 to 3 feet below grade. At boring B9 where impacts were observed, samples were also retained from two deeper intervals (5 and 9 feet below grade). One sediment sample was retained from catch basin CB-3. The retained samples were placed in laboratory-provided glassware, managed in accordance with typical environmental industry practice, and transmitted to a New York State Department of Health (NYSDOH)-approved laboratory for analysis.

The near-surface fill material samples and the B3 and B4 sediment samples were analyzed for Target Compound List (TCL) volatile and semivolatile organic compounds (VOCs and SVOCs) and Target Analyte List (TAL) metals. The B8 soil sample was also tested for NYSDEC Part 375 herbicides and pesticides. The CB-3 sample was analyzed for TCL SVOCs, TAL metals, and herbicides and pesticides. The laboratory report is included in Attachment B. The summarized analytical results were compared to the New York State Department of Environmental Conservation (NYSDEC) Part 375 and CP-51 unrestricted use, restricted residential use, and commercial use Soil Cleanup Objectives (SCOs), as shown in Table 1. The following observations are noted:

- Several petroleum-related VOCs and one chlorinated solvent (trichloroethylene, or TCE) were detected in samples B4 and B9 (5 feet and 9 feet) at concentrations exceeding the NYSDEC unrestricted use SCOs. Two petroleum-related VOCs in the B9 sample from 5 feet also exceeded the restricted residential use SCOs. VOCs were not detected in any of the other samples at levels above the NYSDEC SCOs;
- Several SVOCs were detected in samples B3, B4, B8, B9 (5 feet), and CB-3 at concentrations exceeding the NYSDEC unrestricted use SCOs and, in several cases, the restricted residential or commercial use SCOs. The highest concentrations of SVOCs and metals were identified below the two drywells (B3 and B4) and within the catch basin (CB-3);
- One pesticide (dieldrin) was detected in the B8 sample at a concentration exceeding the NYSDEC unrestricted use SCO, and two pesticides (4,4'-DDE and 4,4'-DDT) were detected in the CB-3 sample at concentrations exceeding the NYSDEC unrestricted use SCOs; and
- One or more metals, including copper, mercury, lead, cadmium, and/or others, were detected in samples B1, B2, B4, B8, B9 (2 feet and 5 feet), and B10 at concentrations exceeding the NYSDEC unrestricted use SCOs and, in several cases, the restricted residential or commercial use SCOs.

The observations and test results indicate that the historic fill is present in the shallow subsurface throughout the property to a depth of about 3 feet and is generally impacted by SVOCs, metals, and/or pesticides at levels that exceed the NYSDEC's unrestricted use SCOs. These impacts are typical of historic fill. Several SVOC and/or metals detections exceed the restricted residential or commercial use SCOs, with the greatest impacts noted in the drywells and catch basin. These more elevated levels may reflect the concentration of impacted materials via collection and infiltration of stormwater runoff.

VOCs, including petroleum-related VOCs and the chlorinated solvent TCE, were identified at two locations on the property (B4 and B9, near the western side of the property) in exceedance of the NYSDEC's unrestricted use SCOs. Petroleum-related xylenes detections exceed the restricted residential use SCOs at the B9 location at a depth of 5 feet. These impacts are delineated vertically to less than about 11 feet below grade at B9. The observations and test results are indicative of a release of petroleum and chlorinated solvents at this location, perhaps in conjunction with the former use of the property by a paint and chemical company.

<u>Groundwater Sampling, Test Results, and Discussion</u>

Groundwater sampling was conducted at the GW-1 through GW-9 locations throughout the property, as shown on Figure 2. At each location, a direct-push rig was utilized to install a one-inch diameter PVC temporary well screen from grade to 10 feet below grade. Prior to sampling, the temporary well screen was purged of approximately three volumes using dedicated polyethylene tubing and a decontaminated check valve. No visible indications of potential contamination were noted during the groundwater purging or sampling, with the exception of GW-7 where a paint/petroleum odor was noted.

The retained samples were placed in laboratory-provided glassware and transmitted to a NYSDOH-approved laboratory to be analyzed for TCL VOCs. The laboratory report is included in Attachment B. The summarized analytical results are shown on Table 2 and are compared to the NYSDEC Class GA Ambient Water Quality Standards (Standards). The following observations were noted:

- Thirteen VOCs, including petroleum-related VOCs and TCE, were detected in the GW-7 sample at concentrations above the NYSDEC Standards, with several detections noted to be elevated. The GW-7 sample was collected in immediate proximity to the source material at B9 and these results indicate that the source material is resulting in groundwater contamination at the property;
- One chlorinated VOC (cis-1,2-dichloroethylene, or cis-1,2-DCE) was detected at GW-1 and three chlorinated VOCs (cis-1,2-DCE, TCE, and vinyl chloride, or VC) were detected at GW-2 at concentrations slightly above the NYSDEC Standards. The GW-1 and GW-2 locations are on the northeastern portion of the property. VC and cis-1,2-DCE are breakdown products from TCE and their detection in these two locations suggests that the groundwater flow direction is likely to the northeast from the TCE-impacted source material at B9 and that TCE is breaking down as it migrates in groundwater;
- One petroleum-related VOC (o-xylene) was detected at a level slightly above its NYSDEC Standard at GW-8. This location is about 20 feet south-southwest of the B9/GW-7 location; the absence of significant groundwater impacts in this direction further indicates that the groundwater flow direction appears to be to the northeast; and
- No impacts exceeding the NYSDEC Standards were detected at the GW-3 to GW-6 locations. This suggests that the plume of VOC-impacted groundwater originating from the B9/GW-7 area is narrow and well-defined.

Soil Vapor Sampling, Test Results and Discussion

Soil vapor samples SV-1 through SV-7 were collected throughout the property from beneath the concrete slab of the former buildings; the locations are shown on Figure 2. Each sample was collected via a soil gas implant installed to a depth of one foot below the concrete slab in accordance with NYSDOH protocols. Following installation, each implant was helium-tested to confirm that ambient air was not bypassing the implant seal. The implant was then purged of three to five volumes at a rate of less than 0.2 liters per minute, attached via polyethylene tubing to a laboratory-supplied Summa canister with a calibrated one-hour flow controller, and allowed to fill at a rate of less than 0.2 liters per minute. The filled canisters were sealed with some vacuum remaining, as per NYSDOH protocol. Canister sampling forms documenting the soil vapor sampling procedures are included in Attachment A.

Upon completion of sampling, the filled canisters were transmitted to the NYSDOH-approved laboratory and the contained samples were analyzed for VOCs via Method TO-15. The laboratory results are summarized in Table 3 and the laboratory report is included in Attachment B.

Although the soil vapor sample results do not include paired indoor air/sub-slab soil vapor datasets, the samples were collected from beneath the existing concrete slab and, therefore, were evaluated as sub-slab vapor samples in accordance with the October 2006 NYSDOH Soil Vapor Intrusion Guidance document, including the matrices updated in May 2017. Our review of these data indicates the following:

- Five VOCs for which the NYSDOH provides guidance, including carbon tetrachloride (CT), cis-1,2- DCE, TCE,1,1-dichloroethene (1,1-DCE), and methylene chloride, were detected in at least one of the soil vapor samples and may pose a concern for soil vapor intrusion (SVI). Based on a comparison to the NYSDOH guidance, the results for 1,1-DCE at SV-7, CT at SV-5 and SV-7, cis-1,2-DCE at SV-1 and SV-3, and methylene chloride at SV-7 could trigger a monitor or mitigate response, and the levels of TCE at SV-1, SV-2, SV-3, and SV-7 would trigger a mitigate response.

All of these VOCs were detected in the source material at B9 and/or in the groundwater beneath the property and the soil vapor detections likely originated from this onsite source; and

- Elevated concentrations of several petroleum compounds were detected at SV-7. These detections also appear related to the impacted soil noted in nearby soil boring B9.

Conclusions and Recommendations

Based on the results of the Phase II investigation, we have reached the following conclusions:

- The property is nearly entirely covered by a one-foot-thick concrete slab and/or pavers associated with the former buildings. Historic fill containing slag, brick and concrete is present generally between 1 and 3 feet below grade throughout the property. The fill typically contains SVOCs, metals, and/or pesticides at concentrations exceeding the NYSDEC's unrestricted use, restricted residential use, and/or commercial use SCOs. These impacts are typical of historic fill in the New York City metro area, which is often contaminated by anthropogenic materials;
- The sediments in catch basin CB-3 and beneath drywells B3 and B4 are impacted with SVOCs, metals, VOCs, and/or pesticides; it is likely that these constituents are being concentrated via stormwater discharges to these structures. Additional catch basins and three suspected former sewer pits are also present onsite;
- Soil impacted with petroleum-related and chlorinated solvent VOCs, SVOCs, and metals is present at boring B9 to a depth of approximately 11 feet below grade. Although the SVOC and metals impacts are likely related to historic fill, the VOC impacts appear to indicate a release of petroleum and chlorinated solvents at this location, perhaps in conjunction with the former use of the property by a paint and chemical company. Some of the same VOCs were also found in nearby drywell B4, suggesting that these impacts extend somewhat to the north of B9. VOC impacts exceeding NYSDEC SCOs were not found in the borings to the south, east or northeast of B9, indicating that the source material is limited in these directions;
- Groundwater is generally found at a depth of approximately 5 feet below grade. Elevated concentrations of both chlorinated and petroleum-related VOCs exceeding the NYSDEC Standards were detected at GW-7, which is in immediate proximity to the B9 source material. These results indicate that the material at B9 is a source of groundwater contamination at the property;
- Slightly elevated concentrations of chlorinated VOCs that appear to be related to the B9 source area were detected on the northeastern portion of the property and indicate that the direction of groundwater flow is to the northeast. One petroleum-related VOC was detected at a level slightly above its NYSDEC Standard at GW-8. This location is about 20 feet south-southwest of the B9/GW-7 location and the absence of significant groundwater impacts in this direction further suggests that the groundwater flow direction is primarily to the northeast. VOC impacts were not found at the GW-3 through GW-6 locations, suggesting that the plume of VOCs in groundwater is narrow and well-defined;
- The concentrations of VOCs in groundwater decrease significantly from the B9/GW-7 source area to the northeast (downgradient) and only one VOC slightly exceeds its NYSDEC Standard at the most northeasterly sampling point (GW-1). Furthermore, the VOCs detected at the downgradient locations consist primarily of breakdown products from the chlorinated solvent found in the source area (TCE). This pattern suggests that the groundwater impacts are confined to the property and are unlikely to extend offsite, and that the TCE is breaking down

as it migrates in groundwater. We note that groundwater is not used on the subject property and public water is supplied to nearby developed properties; and

- VOCs were detected in five of the seven soil vapor samples collected from the property at levels that could present a concern for SVI. TCE was noted to be present at the highest concentrations and all of the VOCs that present SVI concerns were found in the soil and/or groundwater at the property. The highest levels of VOCs, including both chlorinated solvents and petroleum compounds, were found at SV-7, which is in immediate proximity of the B9 source area.

Based on the information from this Phase II investigation, and considering the current property condition, FPM recommends the following:

- Historic fill is present beneath the property and SVOCs, metals, and/or pesticides that exceed applicable criteria. While this fill remains covered by a concrete slab and/or pavers, it does not present a potential exposure concern. In the event that the property is redeveloped, the fill may require proper management;
- VOC-impacted soils in the vicinity of boring B9 and extending to the B4 drywell are presently contributing to groundwater and soil vapor contamination beneath the property. Remediation of these impacted materials is recommended;
- The sediments within the catch basins, drywells, and other subsurface discharge structures on the property are located below grade within the structures and do not present an exposure concern at present. In the event that the property is redeveloped, these materials may require proper management; and
- The soil vapor sampling results indicate the potential for SVI if a building is constructed on the property. As a building is not currently present onsite, SVI does not present a current concern for the property. Remediation of the VOC-impacted soils is likely to reduce or eliminate the potential for SVI.

Should you have any questions, please do not hesitate to call us at (631) 737-6200.

Sincerely,

John Bukoski, P.G. (SOD)

John S. Bukoski, PG
Environmental Scientist
Project Manager

Stephanie O. Davis, P.G.

Stephanie O. Davis, PG
Senior Project Manager
Vice President

JSB/SOD:tac
Attachments
U:\Peninsularockaway-Arker\Far Rockaway\E Site\PhaseIIRpt.Docx

FPM

Catch Basin

Figure 1

GEOPHYSICAL SURVEY RESULTS

51-17 ROCKAWAY BEACH BOULEVARD

FAR ROCKAWAY, NY

Soil and/or Groundwater Sample Location

Soil Vapor Sample Location

Figure 2

SAMPLE LOCATIONS

51-17 ROCKAWAY BEACH BOULEVARD

FAR ROCKAWAY, NY

TABLE 1
SOIL CHEMICAL ANALYTICAL RESULTS
51-17 ROCKAWAY BEACH BOULEVARD
FAR ROCKAWAY, NEW YORK

Sample No.	B1	B2	B3	B4	B5	B7	B8	B9			B10	CB-3	6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives	6 NYCRR Part 375 and CP-51 Restricted Residential Use Soil Cleanup Objectives	6 NYCRR Part 375 and CP-51 Commercial Use Soil Cleanup Objectives
Sample Type	Soil Boring	Soil Boring	Drywell	Drywell	Soil Boring	Soil Boring	Soil Boring	Soil Boring			Soil Boring	Catch Basin			
Sample Depth (feet)	1-3	1-3	2.5-5.5	2-5	1-3	1-3	1-3	2	5	9	1-3	0-2			
Sample Date	2/28/18														
TCL Volatile Organic Compounds in micrograms per kilogram															
1,2,4-Trimethylbenzene	ND	ND	ND	480 J	8.8	ND	ND	ND	ND	1,100	4.4 J	NS	3,600	52,000	190,000
1,3,5-Trimethylbenzene	ND	ND	ND	ND	4.4 J	ND	ND	ND	ND	480 J	ND	NS	8,400	52,000	190,000
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	16	ND	ND	ND	ND	NS	1,800	13,000	130,000
Acetone	15 CCV-E, SCAL-E	ND	ND	ND	26 CCV-E, SCAL-E	28 CCV-E, SCAL-E	ND	16 CCV-E, SCAL-E	ND	ND	35 CCV-E, SCAL-E	NS	50	100,000	500,000
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	ND	7.7	ND	ND	ND	NS	760	2,400	22,000
Chloroform	4.6 J	7.9	ND	ND	ND	ND	ND	ND	**2,200 J**	ND	ND	NS	370	49,000	350,000
cis-1,2-Dichlorothylene	19	42	ND	ND	ND	49	ND	ND	ND	ND	ND	NS	250	100,00	500,000
Cyclohexane	ND	9.2	ND	21,000	ND	ND	ND	4.0 J	ND	ND	ND	NS	-	-	-
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	21 SCAL-E	**24,000 SCAL-E**	ND	ND	NS	1,000	41,000	390,000
Isopropylbenzene	ND	ND	ND	11,000	ND	ND	ND	16	10,000	ND	ND	NS	-	-	-
Methyl Ethyl Ketone	5.7 J	ND	ND	ND	ND	ND	ND	4.1 J,CCV-E	ND	ND	12	NS	120	100,000	500,000
Methylcyclohexane	ND	26	ND	210,000	ND	4.4 J	ND	8.0	ND	ND	ND	NS	-	-	-
Methylene chloride	ND	14 SCAL-E,B	ND	**860 SCAL-E,J**	ND	ND	ND	ND	**29,000 SCAL-E**	**640 J, SCAL-E**	ND	NS	50	100,000	500,000
n-Butylbenzene	ND	ND	ND	26,000	ND	ND	ND	ND	ND	ND	ND	NS	-	-	-
n-Propylbenzene	ND	ND	ND	**30,000**	ND	ND	ND	22	**21,000**	ND	ND	NS	3,900	100,000	500,000
o-Xylene	ND	ND	ND	ND	ND	ND	ND	94 SCAL-E	**110,000 SCAL-E**	ND	ND	NS	260	100,000	500,000
p- & m-Xylenes	ND	ND	ND	ND	ND	ND	ND	120 SCAL-E	**150,000 SCAL-E**	ND	ND	NS	260	100,000	500,000
p-Isopropyltoluene	ND	ND	ND	3,300	ND	ND	ND	18	18,000	ND	ND	NS	-	-	-
sec-Butylbenzene	ND	ND	ND	10,000	ND	ND	ND	14	8,100	ND	ND	NS	11,000	100,000	500,000
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	6,400 SCAL-E	ND	ND	NS	-	-	-
tert-Butylbenzene	ND	ND	ND	2,200	ND	ND	ND	ND	ND	ND	ND	NS	5,900	100,000	500,000
Toluene	ND	8.4	ND	ND	ND	ND	5.5 J	13	**24,000**	ND	ND	NS	700	100,000	500,000
Trichloroethylene	12	78	330 J	**630 J**	6.4 J	72	ND	ND	**9,300**	ND	ND	NS	470	21,000	200,000
Vinyl Chloride	ND	ND	ND	ND	ND	19	ND	ND	ND	ND	ND	NS	20	900	13,000
TCL Semivolatile Organic Compounds in micrograms per kilogram															
1,1-Biphenyl	ND	ND	ND	773	ND	ND	ND	194	16,400	NS	ND	ND	-	-	-
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	**2,080**	ND	ND	NS	ND	ND	1,800	13,000	130,000
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND	ND	ND	566,000	NS	ND	ND	-	-	-
2-Methylnaphthalene	ND	ND	140	13,900	ND	53.6 J	152	2,770	241,000	NS	306	538	-	-	-
2-Methylphenol	ND	ND	ND	ND	ND	ND	ND	342	290,000	NS	419	ND	-	-	-
3- & 4-Methylphenols	ND	ND	ND	ND	ND	ND	ND	1,190	244,000	NS	1,270	225	-	-	-
Acenaphthene	ND	ND	677	4,800	ND	ND	516	ND	5,630	NS	ND	1,660	20,000	100,000	500,000
Acenaphthylene	ND	ND	269	604 J	ND	ND	350	98.7	1,600	NS	ND	651	100,000	100,000	500,000
Anthracene	ND	ND	1,620	5,040	ND	91.0 J	1,570	86.1 J	1,860	NS	129	4,340	100,000	100,000	500,000
Benzo[a]anthracene	ND	ND	**4,830**	**11,800**	ND	359	**4,290**	243	**5,250**	NS	268	**10,300**	1,000	1,000	5,600
Benzo[a]pyrene	ND	ND	**4,600**	**10,400**	ND	470	**4,470**	336	**4,160**	NS	ND	**5,990**	1,000	1,000	1,000
Benzo[b]fluoranthene	ND	ND	**4,030**	**12,800**	ND	412	**4,450**	323	**5,030**	NS	ND	**9,260**	1,000	1,000	5,600
Benzo[g,h,i]perylene	ND	ND	2,330	6,440	ND	368	2,950	490	4,190	NS	179	6,420	100,000	100,000	500,000
Benzo[k]fluoranthene	ND	ND	**3,440**	**8,770**	ND	381	**2,580**	349	**5,490**	NS	ND	**8,840**	800	3,900	56,000
Benzyl butyl phthalate	ND	ND	1,520	ND	ND	ND	ND	128	ND	NS	ND	ND	-	-	-
Bis[2-ethylhexyl]phthalate	ND	ND	2,190	9,850	ND	ND	ND	ND	156,000	NS	ND	2,970	-	-	-
Carbazole	ND	ND	784	762	ND	ND	836	46.7 J	1,420	NS	ND	2,340	-	-	-
Chrysene	ND	ND	**4,770**	**12,400**	ND	369	**4,020**	298	**6,690**	NS	262	**9,320**	1,000	3,900	56,000
Dibenzo[a,h]anthracene	ND	ND	**1,100**	**3,290**	ND	54.4 J	**1,400**	134	**1,610**	NS	ND	**2,220**	330	330	560
Dibenzofuran	ND	ND	390	ND	ND	ND	298	54.9 J	3,390	NS	ND	1,130	-	-	-
Di-n-butyl phthalate	ND	ND	ND	14,200	ND	ND	95.6 J	51.2 J	1,670	NS	ND	1,220	-	-	-
Di-n-octylphthalate	ND	ND	192	ND	ND	ND	ND	ND	ND	NS	ND	ND	-	-	-
Fluoranthene	ND	ND	11,300	32,200	ND	508	9,950	476	14,200	NS	547	24,600	100,000	100,000	500,000
Fluorene	ND	ND	651	5,120	ND	ND	472	ND	4,650	NS	73.2 J	1,600	30,000	100,000	500,000
Indeno[1,2,3-cd]pyrene	ND	ND	**2,290**	**6,310**	ND	306	**2,690**	347	**3,670**	NS	151	**5,690**	500	500	5,600
Naphthalene	ND	ND	248	10,700	ND	ND	214	3,410	**139,000**	NS	634	977	12,000	100,000	500,000
Nitrobenzene	ND	ND	ND	4,440	ND	ND	ND	ND	ND	NS	ND	ND	-	15,000	69,000
Pentachlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	**4,540**	NS	ND	ND	800	6,700	6,700
Phenanthrene	ND	ND	7,230	30,300	ND	202	6,040	299	15,100	NS	486	18,400	100,000	100,000	500,000
Phenol	ND	ND	ND	ND	ND	ND	ND	ND	**26,600**	NS	ND	ND	330	100,000	500,000
Pyrene	ND	ND	8,730	24,300	ND	583	7,540	485	13,500	NS	523	19,400	100,000	100,000	500,000
Part 375 Pesticides/Herbicides in milligrams per kilogram															
4,4'-DDE	NS	NS	NS	NS	NS	NS	ND	NS	NS	NS	ND	**0.0219**	0.0033	8.9	62
4,4'-DDT	NS	NS	NS	NS	NS	NS	0.00271	NS	NS	NS	ND	**0.0176**	0.0033	7.9	47
alpha-Chlordane	NS	NS	NS	NS	NS	NS	0.00584	NS	NS	NS	ND	0.0497	0.094	4.2	24
Dieldrin	NS	NS	NS	NS	NS	NS	**0.0116**	NS	NS	NS	ND	ND	0.005	0.2	1.4
TAL Metals in milligrams per kilogram															
Aluminum	7,800	7,950	266	3,040	2,460	1,920	1,790	3,820	2,310	NS	1,730	ND	-	-	-
Antimony	ND	ND	ND	38.0	ND	ND	ND	0.634	6.12	NS	ND	ND	-	-	-
Arsenic	1.76	1.59	ND	12.9	6.80	4.49	8.01	3.53	5.66	NS	12.3	1.39	13	16	16
Barium	32.5	31.6	26.4	**484**	62.2	53.0	52.9	65.0	276	NS	69.9	ND	350	400	400
Beryllium	ND	ND	ND	ND	ND	ND	0.268	ND	ND	NS	0.430	0.202	7.2	14	590
Cadmium	ND	0.330	ND	**15.0**	ND	ND	0.435	1.45	**4.98**	NS	ND	ND	2.5	4.3	9.3
Calcium	4,170	4,570	1,350	7,050	2,930	6,240	10,900	50,600	6,930	NS	2,300	ND	-	-	-
Chromium	8.51	10.1	3.20	**688**	8.72	4.19	7.57	24.0	**162**	NS	4.77	ND	30	180	1,500
Cobalt	9.46	9.08	0.789	29.9	3.85	4.05	5.88	4.04	4.00	NS	4.03	ND	-	-	-
Copper	**62.1**	**51.1**	8.01	**200**	22.4	15.6	21.3	**68.3**	**279**	NS	25.7	ND	50	270	270
Iron	16,600	15,100	1,930	177,000	6,550	5,030	6,060	8,990	7,840	NS	7,170	ND	-	-	-
Lead	17.8	17.3	16.7	**1,420**	9.80	6.73	47.3	**78.3**	**1,210**	NS	35.3	ND	63	400	1,000
Magnesium	3,290	3,450	139	2,030	276	767	1,190	19,600	10,100	NS	244	ND	-	-	-
Manganese	138	95.2	11.6	689	57.9	105	48.0	128	50.5	NS	85.5	ND	1,600	2,000	10,000
Mercury	0.0582	ND	ND	**4.69**	0.0402	ND	0.0362	**0.676**	0.0992	NS	**1.41**	0.820	0.18	0.81	2.80
Nickel	19.2	20.2	1.87	**107**	9.64	9.09	12.7	12.8	28.8	NS	8.95	4.61	30	310	310
Potassium	990	1,110	47.3	96.4	334	320	225	168	220	NS	143	ND	-	-	-
Selenium	ND	ND	ND	ND	ND	ND	ND	**6.30**	**4.37**	NS	ND	ND	3.9	180	1,500
Silver	ND	ND	ND	**9.44**	ND	ND	ND	ND	1.62	NS	ND	0.614	2	180	1,500
Sodium	691 B	753 B	69.9 B	106 B	129 B	118 B	135 B	31.6 B	780 B	NS	101 B	ND	-	-	-
Thallium	ND	ND	ND	6.72	ND	ND	ND	ND	ND	NS	ND	4.26	-	-	-
Vanadium	48.7	55.3	3.06	32.7	12.1	9.48	7.61	14.1	82.0	NS	7.80	ND	-	-	-
Zinc	46.6	55.5	31.1	**5,630**	47.0	22.6	50.4	**944**	**1,050**	NS	94.6	ND	109	10,000	10,000

Notes:
Only analytes detected in one or more samples are included herein.
J = Estimated concentration below the Reporting Limit but exceeding the Method Detection Limit.
ND = Not detected at or above the method detection limit.
- = Not established
Bold yellow values exceed NYSDEC Unrestricted Use Soil Cleanup Objectives
Bold orange values exceed NYSDEC Restricted Residential Use Soil Cleanup Objectives
Bold red values exceed NYSDEC Commercial Use Soil Cleanup Objectives
SCAL-E = The reported value is estimated due to its behavior during initial calibration.
CCV-E = The reported value is estimated due to its behavior during continued calibration.
B = Analyte is found in an associated analysis batch blank.

TABLE 2
GROUNDWATER CHEMICAL ANALYTICAL DATA
51-17 ROCKAWAY BEACH BOULEVARD
FAR ROCKAWAY, NEW YORK

Analyte	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	GW-7	GW-8	NYSDEC Class GA Ambient Water Quality Standards
	2/28/2018								
Volatile Organic Compounds in micrograms per liter									
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	23	ND	5
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND	16	ND	5
1,2,4-Trimethylbenzene	ND	ND	ND	ND	ND	ND	**3,100**	3.3	5
1,3,5-Trimethylbenzene	ND	ND	ND	ND	ND	ND	**1,300**	4.9	5
2-Butanone	2.5	2.9	1.2	0.70 J	ND	2.0 J	ND	1.3	50
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	6.0 J	ND	-
Acetone	12 ICV-E, SCAL-E	34 ICV-E, SCAL-E	11 ICV-E, SCAL-E	5.5 ICV-E, SCAL-E	16 ICV-E, SCAL-E	23 ICV-E, SCAL-E	27 J, ICV-E, CCV-E	11 ICV-E, SCAL-E	50
Benzene	ND	ND	ND	ND	ND	ND	**42**	ND	0.7
Carbon disulfide	0.32 J	ND	0.44 J	ND	ND	ND	5.8 J	ND	60
Chloroform	3.6	3.9	ND	ND	ND	ND	**120**	ND	7
cis-1,2-Dichloroethylene	**7.4**	**12**	ND	0.58 J	ND	ND	ND	ND	5
Cyclohexane	ND	0.50 J	ND	ND	ND	ND	ND	ND	-
Ethylbenzene	ND	ND	ND	ND	ND	ND	**400**	0.48 J	5
Isopropylbenzene	ND	ND	ND	ND	ND	ND	**66**	ND	5
Methylcyclohexane	ND	1.2	ND	0.78 J	ND	ND	ND	ND	-
Methylene chloride	ND	ND	ND	ND	ND	ND	**800 CCV-E, SCAL-E**	ND	5
n-Butylbenzene	ND	ND	ND	ND	ND	ND	**22**	ND	5
n-Propylbenzene	ND	ND	ND	ND	ND	ND	**100**	ND	5
o-Xylene	ND	ND	ND	ND	ND	ND	**2,100**	**5.4**	5
p- & m-Xylenes	ND	ND	ND	ND	ND	ND	**2,800**	2.2	5
p-Isopropyltoluene	ND	ND	ND	ND	ND	ND	**110**	ND	5
tert-Butyl alcohol (TBA)	1.4 CCV-E, J	1.2 CCV-E, J	1.3 CCV-E, J	ND	ND	2.7 CCV-E, J	ND	ND	-
Toluene	ND	3.9	ND	ND	ND	ND	**550**	0.58 J	5
trans-1,2-Dichloroethylene	ND	0.60 J	ND	ND	ND	ND	ND	ND	5
Trichloroethylene	4.8	**6.8**	ND	ND	ND	ND	**180**	ND	5
Vinyl chloride	ND	**4.4**	ND	ND	ND	ND	ND	ND	2

Notes:

Only analytes detected in one or more samples are included herein. See laboratory report for a complete list of analytes.
CCV-E, ICV-E, Scale-E = Estimated concentration due to behavior during calibration.
J = Estimated concentration below the Reporting Limit but exceeding the Method Detection Limit.
ND = Not detected at or above the Method Detection Limit.
NYSDEC = New York State Department of Environmental Conservation
\- = Not established.
Bold shaded values exceed NYSDEC Class GA Ambient Water Quality Standards.

TABLE 3
SOIL VAPOR SAMPLING RESULTS
51-17 BEACH CHANNEL DRIVE, FAR ROCKAWAY, NEW YORK

Sample No.	SV-1	SV-2	SV-3	SV-4	SV-5	SV-6	SV-7	Indoor Air Background Levels, Residential**	Indoor Air Background Levels, Commercial*
Sample Date	2/28/18								
Volatile Organic Compounds in ug/m^3									
1,1-Dichloroethane	ND	ND	0.979	ND	ND	ND	18.8	<0.25 - <0.25	<0.4 - <0.8
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	**29.7**	<0.25 - 0.7	<0.9 - <1.6
1,2,4-Trimethylbenzene	16.8	14.3	18.2	22.2	17.1	19.2	1,250	<0.25 - 6.3	1.7 - 13.7
1,3,5-Trimethylbenzene	6.00	5.26	5.21	6.39	5.75	6.19	1,840	0.3 - 6.5	<1.3 - 4.6
1,3-Butadiene	1.49	3.65	80.3	47.3	ND	0.553	ND	-	<2.3 - <7.5
1,4-Dichlorobenzene	1.36	3.54	ND	ND	ND	ND	ND	<0.25 - 2.6	<0.8 - 12.5
2-Hexanone	ND	ND	1.25	1.26	2.04	1.74	ND	-	-
2,2,4-Trimethylpentane	ND	ND	ND	ND	1.19	ND	ND	-	-
4-Ethyltoluene	4.56	3.80	4.53	6.29	4.43	4.72	482	-	<1.5 - 5.9
4-Methyl-2-pentanone	ND	ND	ND	5.82	ND	ND	ND	-	<1.2 - 8.1
Acetone	68.2	117	79.8	53.2	71.5	41.6	220	9.9 - 140	32.4 - 120.2
Benzene	8.15	4.41	43.8	124	0.744	0.783	64.9	1.1 - 29	2.1 - 12.5
Carbon disulfide	7.82	9.53	7.94	2.99	12.5	14.4	32.4	-	<0.8 - 6.4
Carbon Tetrachloride	1.49	ND	4.40	ND	**12.5**	ND	**32.9**	<0.25 - 1.1	<0.8 - 0.7
cis-1,2-Dichloroethene	**22.2**	4.64	**21.3**	ND	1.13	ND	ND	<0.25 - 1.2	<0.8 - <2.0
Chloroform	6.06	1.32	8.89	ND	3.90	2.59	136	<0.25 - 4.6	<0.4 - 1.4
Chloromethane	0.522	0.502	0.558	ND	ND	0.580	ND	<0.25 - 5.2	2.1 - 4.4
Cyclohexane	3.42	4.41	3.48	3.86	3.48	5.65	97.4	<0.25 - 19	-
Ethyl Acetate	2.61	3.56	ND	ND	ND	ND	ND	-	<1.0 - 9.5
Ethyl Alcohol	74.4	113	ND	ND	ND	ND	ND	27 - 3,000	-
Ethylbenzene	8.86	7.30	6.56	8.60	4.95	4.86	1,210	0.4 - 13	<1.6 - 7.6
Freon 11	ND	1.27	1.35	ND	1.52	1.14	ND	1.1 - 30	<3.7 - 54.0
Freon 12	1.94	2.01	2.00	1.87	2.19	1.94	ND	<0.25 - 26	4.8 - 32.9
Heptane	77.9	51.6	19.0	43.0	1.35	13.4	343	1 - 33	-
Hexane	198	32.2	18.4	16.5	1.09	1.99	214	0.6 - 35	1.6 - 15.2
iso-Propyl alcohol	ND	7.92	1.80	1.26	ND	ND	ND	-	-
m&p-xylene	29.6	29.3	26.1	32.5	23.3	22.3	7,640	0.5 - 21	4.1 - 28.5
Methyl Ethyl Ketone	45.1	52.2	14.6	29.5	13.2	14.7	82.6	1.4 - 39	3.3 - 13.5
Methylene chloride	ND	ND	ND	ND	ND	ND	**577**	0.3 - 45	<1.7 - 16.0
o-Xylene	12.0	11.4	10.9	12.5	9.51	9.25	4,950	0.4 - 13	<2.4 - 11.2
Styrene	2.13	1.91	1.83	2.33	1.37	1.33	66.4	<0.25 - 2.3	<1.6 - 4.3
tert-Butyl Alcohol	3.70	4.70	ND	1.95	ND	ND	ND	-	
Tetrachloroethene	6.21	4.48	4.04	3.48	2.87	2.79	ND	<0.25 - 4.1	<1.9 - 25.4
Tetrahydrofuran	10.0	10.6	2.82	4.19	1.68	1.70	ND	<0.25 - 9.4	-
Toluene	27.7	43.0	29.1	70.8	8.67	8.67	1,610	3.5 - 110	10.7 - 70.8
Trichloroethene	**173.0**	**93.0**	**303**	5.43	5.80	3.87	**554**	<0.25 - 0.8	<1.2 - 6.5

Notes:

All samples analyzed using Method TO-15.
Only compounds detected in one or more samples are reported herein. See lab report for complete data.
ug/m^3 = micrograms per cubic meter.
Shaded compounds are those for which the NYSDOH has provided guidance.
Yellow- shaded **bold** results indicate a monitor or mitigate response.
Pink-shaded **bold** results indicate a mitigate response.
ND = Not detected.
* = US EPA BASE Study 2001; 25th to 95th percentiles.
** = NYSDOH Study 2003; 25th to 95th percentiles.