Fenley & Nicol Environmental Inc.

"SOLUTIONS AT WORK"®

445 Brook Avenue, Deer Park, NY 11729 (631) 586-4900 • NYC (718) 204-4993 FAX (631) 586-4920

VOLUNTARY CLEANUP INVESTIGATION REPORT VCP No. V-00242-1. 45 Kean Street West Babylon, New York

Volume I of IV

Prepared For: New York State Department of Environmental Conservation
Bureau of Eastern Remedial Action
Division of Environmental Remediation
50 Wolf Road
Albany, New York 12233-7010

Attention: Jeffrey L. Dyber, P.E.
Environmental Engineer II

Prepared By: Fenley and Nicol Environmental, Inc.
445 Brook Avenue
Deer Park, NY 11729

Mostafa El Sehamy, P.G., C.G.W.P.

Mark E. Robbins, C.G.P.

Date: April 20, 2001

F&N Job No. 9615107

Voluntary Cleanup Investigation Report
VCP No. V-00242-1
45 Kean Street
West Babylon, New York

April 20, 2001

Fenley & Nicol, Environmental, Inc. (F&N) has prepared this Voluntary Cleanup Investigation Report for the property located at 35-45 Kean Street in West Babylon, New York for the New York State Department of Environmental Conservation. The work documented in this Investigation Report was prepared based upon a Voluntary Cleanup Agreement dated June 21, 2000 and a Voluntary Cleanup Investigation Work Plan prepared on November 19, 1999.

Should you have any questions or comments regarding the contents of this report, please feel free to contact us at your convenience.

Very truly yours,
Fenley & Nicol Environmental, Inc.

Mark E. Robbins, C.P.G.
Senior Geologist

Mostafa El Sehamy, P.G, C.G.W.P.
Director, Professional Services

Fenley & Nicol Environmental Inc.

Certification
VCP No. V-00242-1
45 Kean Street
West Babylon, New York

April 20, 2001

In accordance with the Voluntary Cleanup Agreement, this Certification attests that the individual below had the primary responsibility for the day to day performance of the Voluntary Cleanup Investigation and that all activities that comprised the Voluntary Cleanup Investigation were performed in full accordance with the Voluntary Cleanup Investigation Work Plan dated November 19, 1999.

Fenley & Nicol Environmental, Inc.

Mark E. Robbins, C.P.G.
Senior Geologist

Fenley & Nicol Environmental Inc.

TABLE OF CONTENTS
Volume I of IV

TABLE OF CONTENTS (cont.)

Volume II of IV

Sheets

1. Site Location Map
2. Site Plan
3. Total VOCs in Soil
4. Tetrachloroethene in Soil
5. Trichloroethene in Soil
6. Groundwater Gradient Map
7. Total VOCs in Groundwater
8. 1,1,1-Trichloroethane in Groundwater
9. 1,1-Dichloroethane in Groundwater
10. Total SVOCs in Groundwater
11. Total VOCs in Drywells

Volume III of IV

Tables

1. PID Screening Results
2. 95-1 Soil Results - GP-1
3. 95-1 Soil Results - GP-4
4. 95-1 Soil Results - GP-5
5. 95-1 Soil Results - GP-6
6. 95-1 Soil Results - GP-7
7. Groundwater Elevation Data
8. 95-1 Groundwater Results - GP-1
9. 95-1 Groundwater Results - GP-2
10. 95-1 Groundwater Results - GP-3
11. 95-1 Groundwater Results - GP-4
12. 95-1 Groundwater Results - GP-5
13. 95-1 Groundwater Results - GP-6
14. 95-1 Groundwater Results - GP-7
15. 95-1 Groundwater Results - GP-8

TABLE OF CONTENTS (cont.)

Appendices

Volume IV of IV

1.0 EXECUTIVE SUMMARY

Fenley & Nicol Environmental, Inc. (F&N) has performed a Voluntary Cleanup Investigation of the property located at 45 Kean Street in West Babylon, New York. This investigation was performed pursuant to a Voluntary Cleanup Agreement between the New York State Department of Environmental Conservation and the property owner executed June 21, 2000. The property has been assigned the NYSDEC identification V-00242-1.

The Investigation was performed in accordance with a Voluntary Cleanup Investigation Work Plan prepared by F&N dated November 19, 1999. The New York State Department of Environmental Conservation approved the Voluntary Cleanup Investigation Work Plan on December 2, 1999.

The results of the Voluntary Cleanup Investigation are contained in this report. The Voluntary Cleanup Investigation has revealed the presence of chlorinated solvents in groundwater beneath the northeast portion of the site and the presence of volatile organic compounds in a stormwater drywell. Based upon the results of the investigation, it is F&N's professional opinion that no further investigation/remediation is required for the Site.

No effort has been made to perform any investigation beyond what is included in this report and approved in the Work Plan. The observations and discussions included herein summarize the apparent subsurface conditions at the property up to the date of the completion of the fieldwork.

The following sections provide the details and specific information pertaining to the various components of the Voluntary Cleanup Investigation.

2.0 INTRODUCTION

Fenley and Nicol Environmental, Inc. (F&N) is currently engaged in the subsurface investigation of the former Diamond Roller property located at 45 Kean Street in West Babylon, New York (hereinafter referred to as the *"Site"*). This report provides the findings and conclusions of an investigation performed to delineate the extent of hazardous substances in soil and groundwater. This report was prepared for submission to the New York State Department of Environmental Conservation ("NYSDEC") pursuant to a Voluntary Cleanup Agreement executed June 21, 2000. The Site has been assigned the NYSDEC identification V-00242-1.

The Investigation was performed in accordance with a Voluntary Cleanup Investigation Work Plan ("Work Plan") dated November 19, 1999 and approved by the NYSDEC. F&N performed the field portion of the investigation with oversight by the NYSDEC.

3.0 SITE BACKGROUND

3.1 Site Description

The Site consists of a 1 story industrial building formerly occupied by Diamond Roller. ASA Plumbing currently occupies the Site. The property is located along the east side of Kean Street. An asphalt parking area is located in the southern and eastern portions of the Site. A concrete parking area is located in the western portion of the Site. The vicinity of the Site consists of industrial and commercial properties. A landfill is located to the east of the Site.

Sheet 1 of 11 provides a Site Location Map.

Sheet 2 of 11 provides a Site Plan.

3.2 Site History

A review of the regulatory agency file for the Site identifies the following:

- The office of the Town of Babylon Tax Assessor indicates that the current owner is identified as Mr. Max Gysin. The Tax Map number for the parcel is section 075.00, Block 02.00, Lot 017.003.
- The Site is zoned as an industrial property.
- The RCRA database files maintained by the United States Environmental Protection Agency (USEPA) list the property as a RCRA Generator site, which generates less than 100 kilograms a month of hazardous waste and has the ID# NYD98703662.
- The Site is listed on the USEPA identification index as a RCRA Generator and a FINDS Site.

Diamond Roller, an industrial facility that manufactured press rollers, occupied the Site from its initial development during 1970 until a date prior to 1995. General Consolidated Industries, Inc. (GCI) performed a Phase I Environmental Site Assessment/Targeted Phase II Assessment of the property that was published during October 1995. The findings of the Phase I portion indicated that there are nine (9) drywells outside the building and there were no floor drains or any other subsurface structure identified inside the building. During the Phase I investigation, 55-gallon drums were utilized for the storage of solvents were present at the Site and stained areas of asphalt were identified in the eastern and southeastern portions of the Site. According to the Phase I, the site was cited for haphazard drum storage during 1979, 1983 and 1984, which impacted on-site drywells.

The Targeted Phase II portion of the assessment was performed to determine the potential impact to the nine (9) drywells and one (1) septic at the Site. GCI collected sediment samples and each was screened for organic vapors. The screening results indicated an organic vapor range of 117 parts per million (ppm) to 3 ppm. GCI then transmitted four (4) samples to an independent laboratory for volatile organic compound (VOC), semi-volatile organic compounds (SVOCs) and metals. The total VOC/SVOC concentrations were found to be 3,911,592 parts per billion (ppb) in DW-1, 26 ppb in DW-5, 353 ppb in DW-6 and 46,911 ppb in septic C-1. The individual constituent identified at the greatest concentrations was 1,1,1-Trichloroethane, at 3,191,958 ppb in drywell DW-1. Drywell DW-1 was located in the northeast corner of the Site.

F&N performed prior investigatory and remedial work at the Site. During March 1996, groundwater samples were obtained from groundwater sampling probes and four (4) monitoring wells. The groundwater samples were obtained from the water table and from three feet below the water table. The results of the groundwater analyses indicated the presence of VOCs. F&N also performed a slug test, which identified hydraulic conductivities ranging from 78 to 80 feet per day.

F&N performed an additional groundwater investigation during June-July 1998. The results of this additional groundwater investigation confirmed the presence of VOCs at depths below the water table.

Section 4.0 of this report provides further detail of prior investigations conducted at the Site by F&N.

3.3 Site Vicinity

As per the November 19, 1999 Work Plan, regulatory agency file reviews were performed with respect to properties located adjacent to the Site. The addresses of the adjacent properties are listed as follows:

Address	Occupant	Direction from Site
42-46 Kean Street	Floral Industrial	South
34-38 Kean Street	Vacant	West
55 Kean Street	Garal Wholesales Limited	North
42 Lamar Street	RM Manufacturing	East
34 Lamar Street	Nassau Tools Works	Southeast

The following sections provide the results of the regulatory agency file reviews for each property above.

42-46 Kean Street

A review of the regulatory agency files for the above property identifies the following:

- The office of the Town of Babylon Tax Assessor indicates that the current owner is identified as Report Investment Corporation. The Tax Map number for the parcel is section 075.00, Block 02.00, Lots 008.003.
- The site is zoned as an industrial property.

34-38 Kean Street

A review of the regulatory agency file for the above property identifies the following:

- The office of the Town of Babylon Tax Assessor indicates that the current owner is identified as Maybruch & Lipsky, Inc. The Tax Map number for the parcel is section 075.00, Block 02.00, Lots 008.004.
- The site is zoned as an industrial property.

55 Kean Street

A review of the regulatory agency file for the above property identifies the following:

- The office of the Town of Babylon Tax Assessor indicates that the current owner is identified as Komin Enterprises, Inc. The Tax Map number for the parcel is section 075.00, Block 02.00, Lots 029.001.
- The site is 0.11 miles northeast of the subject property and is zoned as an industrial property.

42 Lamar Street

A review of the regulatory agency file for the above property identifies the following:

- The office of the Town of Babylon Tax Assessor indicates that the current owner is identified as United Equities Corp. The Tax Map number for the parcel is section 075.00, Block 02.00, Lots 024.000.
- The site is zoned as an industrial property.

34 Lamar Street

A review of the regulatory agency file for the above property identifies the following:

- The office of the Town of Babylon Tax Assessor indicates that the current owner is identified as Edison Realty. The Tax Map number for the parcel is section 075.00, Block 02.00, Lots 023.004.
- The site is 0.11 miles southeast of the subject property and is zoned as an industrial property.
- The RCRA database files maintained by the USEPA lists the property as a RCRA Hazardous Waste Small Quantity Generator.
- Underground storage tanks are present at the site:

Size	Under/Above	Product
4,000 g	Underground	#2 Fuel Oil
500 g	Aboveground	Waste Oil

- The site is listed on the USEPA identification index, for being listed as a RCRA Generator Site and a Find Site.

Appendix A provides copies of the regulatory agency documents.

3.4 Site Geology

The Site is located in the western portion of Suffolk County, New York. The elevation of subject property is approximately 70 feet above mean sea level *(U.S.G.S. 7.5-Minute Amityville, New York Quadrangle, 1959, Photorevised 1979).*

Long Island consists of a wedge-shaped mass of unconsolidated deposits that overlie ancient basement rock. The thickness of these deposits ranges from approximately 100 feet on the Island's north shore, to approximately 2,000 feet in some portions of the south shore. These deposits contain groundwater that is the sole source of drinking water for the Island's residents. The 1990 U.S. census indicates that Nassau and Suffolk Counties have a combined population of approximately 2.6 million residents.

The major landforms of Long Island of importance to the hydrologic system are the moraines and outwash plains, which originated from glacial activity. The moraines represent the farthest extent of the glacial advances. The moraines consist of till, which is a poorly sorted mixture of sand, silt, clay, gravel and boulders. The till is poorly to moderately permeable in most areas. Outwash plains are located to the south of the moraines. The outwash plains were formed by the action of glacial meltwater streams, which eroded the headland material of the moraines and laid down deposits of well-sorted sands, silts and gravels. These outwash deposits are moderately to highly permeable.

3.5 Site Hydrogeology

The **Upper Glacial Aquifer** is the uppermost hydrogeologic unit. This aquifer encompasses the moraine and outwash deposits, in addition to some localized lacustrine, marine, and reworked materials. A relatively high

horizontal hydraulic conductivity and a low vertical hydraulic conductivity characterize the outwash plain portion of this unit. Since the water table is situated in the Upper Glacial Aquifer, the water quality has been degraded in many areas due to industrial activities.

The **Magothy Formation** directly underlies the Upper Glacial Aquifer in the vicinity of the Site. This formation is a Cretaceous coastal-shelf deposit, which consists principally of layers of sand and gravel with some interbedded clay. This formation ranges from poorly to moderately or highly permeable. A clay layer in some parts of Long Island confines the uppermost portion of the aquifer. The Magothy is Long Island's principal aquifer for public water supply. The USEPA has classified the Long Island aquifer system as a sole source aquifer.

The **Raritan Formation** is the deepest unit and rests directly above the bedrock units. This formation is comprised of a sand member (**Lloyd Aquifer**) and a clay member (**Raritan Clay**). The Lloyd sand extends southward toward the Atlantic Ocean and its thickness increases toward the southeast. The surface of the sand member ranges in depth from 200-800 feet below sea level (from northwest to southeast).

The depth to groundwater beneath the subject property is approximately 14 feet below ground surface. The groundwater flow direction beneath the subject property, as determined from previous investigations performed by F&N, is toward the south-southeast. This groundwater represents the upper portion of the Upper Glacial Aquifer.

4.0 RESULTS OF PREVIOUS FIELD INVESTIGATIONS

F&N has conducted three (3) investigations at the Site prior to this Investigation. The initial investigation was performed during January - February 1996 and was based upon the Phase I Environmental Site Assessment/Targeted Phase II Assessment performed by GCI. The second investigation was performed during March 1996 and was based upon the January - February 1996 investigation. The third investigation was performed during July 1998 and was based upon the March 1996 investigation. The following sections provide the results of each investigation.

Appendix B provides copies of prior F&N reports.

4.1 February 1996 Subsurface Investigation

The February 1996 subsurface investigation was performed based upon GCI's prior environmental activities. The fieldwork consisted of the characterization of a drywell located in the northeast corner of the Site (GCI's DW-1) and the sampling of the septic pool (GCI's C-1) at the Site. The drywell was identified during this investigation as the "former drywell". The former drywell is indicated on the Site Plan, Sheet 2.

The laboratory results from the drywell and septic pool indicated elevated concentrations of VOCs. In order to address the elevated concentrations of VOCs, F&N excavated and removed the contaminated sludge from both structures utilizing a Guzzler Truck. Following the cleanout, endpoint samples were obtained. The endpoint results for the drywell indicated elevated levels of the following VOCs:

Compound	Concentration (ppb)
n-Propylbenzene	15,000
1,1-Dichloroethane	53,000
1,1-Dichloroethene	92,000
Tetrachloroethene	62,000
Toluene	430,000
1,1,1-Trichloroethane	6,000,000
Trichloroethene	14,000
1,2,4-Trimethylbenzene	84,000
1,3,5-Trimethylbenzene	33,000

The results of the endpoint sample for the septic pool indicated low concentrations of volatile organic compounds and metals that were below applicable regulatory standards as documented in NYSDEC Technical and Operational Guidance Memorandum (TAGM) #4046.

The drywell was then excavated and additional soil was removed. The excavation was extended to the water table, which was present at eighteen (18) feet below grade. The results of an additional endpoint sample indicated that VOCs were still present at concentrations exceeding regulatory standards. The excavation was backfilled with clean soil.

A soil probe was subsequently installed and sampled in the center of the former drywell. Based upon the screening of the soil samples with an Organic Vapor Analyzer (OVA), the zone of VOCs was determined to extend to a depth of approximately 28 feet below grade. The following breakdown provides the OVA headspace analysis of the soil samples.

Depth (ft)	Hnu Reading (ppm)	OVA Reading (ppm)
18-20	180	>1000
20-22	160	>1000
22-24	58	>1000
24-26	105	>1000
26-28	50	28
28-30	2	6

Four (4) monitoring wells were later installed in the vicinity of the former drywell *(see Site Plan, Sheet 2)*. Two monitoring wells were installed upgradient of the former drywell and were designated as FN-1 and FN-2. Two monitoring wells were installed downgradient of the former drywell and were designated as FN-3 and FN-4. Representative groundwater samples were obtained from each of the monitoring wells for analyses. The following VOCs were identified:

Compound	FN-1 (ppb)	FN-2 (ppb)	FN-3 (ppb)	FN-4 (ppb)
Chloroethane	nd	nd	12	nd
1,1-Dichloroethane	8.1	8.8	140	540
1,1-Dichloroethene	nd	nd	32	64
Tetrachloroethene	13	5.6	9.6	nd
Toluene	nd	nd	nd	100
1,1,1-Trichloroethane	85	250	2,900	7,200
Trichloroethene	14	5.9	11	nd

nd . . . None Detected

Based upon the overall results of the surface investigation and remedial activities, additional work was required by the Suffolk County Department of Health Services to define the extent of the VOC plume.

4.2 March 1996 Extended Subsurface Investigation

The investigative efforts conducted by F&N consisted of the installation and sampling of five (5) groundwater sampling probes utilizing direct-push technology, laboratory analyses of groundwater samples, the surveying of the property and the performance of a hydrogeologic slug test. Sampling probe HP-

1 was located in the northeast corner of the property, southeast of monitoring well FN-4. Sampling probe HP-2 was installed approximately twenty (20) feet to the south of HP-1. Sampling probe HP-3 was installed in the east central portion of the Site, approximately twenty (20) feet to the south of HP-2. Sampling probes HP-4 and HP-5 were installed in the southeast corner of the Site.

The following VOCs were identified in the groundwater sampling probes. All concentrations are reported in parts per billion.

Compound	HP-1	HP-2	HP-3	HP-4	HP-5
Chloroethane	11	nd	nd	nd	nd
1,1-Dichloroethane	110	6.4	nd	13	nd
1,1-Dichloroethene	260	nd	nd	5.5	nd
1,1,1-Trichloroethane	2,700	280	63	280	nd

Nd . . . None Detected

The results of the groundwater samples revealed that the VOC plume was primarily located in the northeast portion of the property. The plume appeared to have migrated in the downgradient direction. No sampling probes were installed to the south and downgradient of the Site. However, based upon the results of the five (5) sampling probes, the groundwater plume did not appear to have spread appreciably to adjacent properties.

The results of the site survey and groundwater elevation measurements revealed that the local groundwater flow direction agreed with the regional flow direction. Groundwater was found to flow toward the southeast.

The results of the slug test revealed that the sediments beneath the property yield a high hydraulic conductivity. Values were found to range from 78 to 80 feet per day. These values are characteristic of the subsurface geology,

which is made up of coarse sands and gravels deposited as outwash from the retreating glaciers.

4.3 July 1998 Subsurface Investigation III

The scope of work for the July 1998 subsurface investigation consisted of the collection of thirty five (35) groundwater samples from ten (10) sampling locations utilizing a direct push technology to determine the vertical extent of the VOC plume. In addition, the investigation consisted of the sampling of monitoring wells FN-1 through FN-4 and the laboratory analyses of the groundwater samples.

Sampling location EP-1 was installed 20 feet to the east of FN-4 and was sampled at the depths of 18 feet, 32 feet, 42 feet, 52 feet and 62 feet below grade. Sampling location EP-2 was installed 10 feet to the west of FN-4 and was sampled at the depths of 18 feet, 32 feet, 42 feet, 52 feet and 62 feet below grade. Sampling location EP-3 was installed 50 feet to the south of FN-4 and was sampled at the depths of 18 feet and 32 feet below grade. Sampling location EP-4 was installed 120 feet to the south of FN-4 and was sampled at the depths of 18 feet, 32 feet, 42 feet, 52 feet and 62 feet below grade. Sampling location EP-5 was installed in the southeast corner of the Site and was sampled at the depths of 18 feet and 32 feet below grade. Sampling location EP-6 was installed in the southeast corner of the Site and was sampled at the depths of 18 feet, 32 feet, 42 feet, 52 feet and 62 feet below grade. Sampling location EP-8 was installed in the southeast corner of the Site and was sampled at the depths of 18 feet and 32 feet below grade. Sampling location EP-9 was installed at the southeast corner of the building and was sampled at the depths of 18 feet and 32 feet below grade.

Sampling location EP-10 was installed 10 feet to the south of FN-4 and was sampled at the depths of 18 feet, 32 feet, 42 feet, 52 feet and 62 feet below grade.

The compound 1,1,1-Trichloroethane was not identified in any of the groundwater samples from EP-1, EP-2, EP-6 through EP-10, FN-1 and FN-2. 1,1,1-Trichloroethane was identified in the following groundwater samples:

Sample Location	Sample Depth (ft)	1,1,1-Trichloroethane (ppb)
EP-3	18	5.9
EP-4	18	6.5
EP-5	18	26
	32	5.6
FN-3	18	81
FN-4	18	11

The compound 1,1,1-Trichloroethane was not identified in the remaining samples collected from EP-3 through EP-5, FN-3 and FN-4.

Overall, the results of the groundwater sampling indicated significantly lower levels of VOCs as compared to the March 1996 Extended Subsurface Investigation. Three (3) of four (4) monitoring wells were found to contain low levels of VOCs. The highest levels of VOCs were identified in monitoring well FN-2, at 164.4 ppb. The VOC plume was again found to be primarily located in the northeast portion of the Site, with limited downgradient migration. Based upon the sampling results, the VOC plume did not appear to migrate beyond the southern property boundary. No sampling probes were installed beyond the Site's property boundaries.

5.0 SAMPLING AND ANALYSIS PLAN

The following sections provide the protocols utilized during the August 2000 investigation. See *Sheet 2, Site Plan,* for the locations of all soil probes, groundwater sampling probes and drywells.

5.1 Soil Probes

F&N installed a total of five (5) soil probes at the property. The soil probes were installed utilizing a Simco® Earthprobe 200. The soil sampler that was utilized to collect each soil sample consisted of a non-discrete 4-foot long, 2-inch diameter sampler or a 2-foot long, 1 ½ inch diameter sampler. A dedicated acetate liner was inserted into each soil sampler prior to sample collection. The soil samplers were decontaminated following the completion of each soil probe. Following the completion of each soil probe, the location was surveyed and noted on the sampling plan.

Soil probe GP-1 was installed at the location of the former drywell. Soil probes GP-4 through GP-7 were installed in the immediate vicinity of four (4) roof drains located along the eastern exterior wall of the building. Soil probes GP-1 and probes GP-4 through GP-7 were continuously sampled at 2-foot intervals from the ground surface to the water table, which is located at 14 feet below ground surface.

Soil probe GP-14 was installed through the interior of former drywell DW-7. Subsequent to the completion of the Work Plan, drywell DW-7 had been filled to grade with soil and paved over with concrete by the current occupants of the Site. At the instruction of the NYSDEC, soil samples were collected from

drywell DW-7 at the depth intervals of zero to 2 feet and 10 to 12 feet below ground surface.

Separate aliquots of each soil sample were placed directly into pre-labeled zip-lock bags and 4 ounce jars. The zip-lock bags were allowed to sit for 5 minutes prior to field characterization by an F&N geologist. The 4-ounce jars were placed directly into a cooler filled with ice and maintained at 4 degrees Celsius.

The field characterization consisted of preparing a boring log that described the soil characteristics and screening each soil sample utilizing a Photoionization Detector (PID). The PID has a minimum detection limit of 0.1 ppm.

Appendix C provides copies of the F&N Probe Logs.

5.2 Groundwater Sampling Probes

Thirteen (13) groundwater sampling probes were installed at the Site. Each groundwater sampling probe was installed utilizing a similar technology to the soil probes and consisted of a 4-foot long, ¾ inch diameter stainless steel screen. The stainless steel screen has a screen width of 0.020 inches and was decontaminated between each use. The stainless steel screen was installed to the desired sampling depths and each depth was appropriately sampled before the steel screen was removed from the ground.

Representative groundwater samples were collected from each groundwater probe utilizing an inertial pump, consisting of a foot check valve

and dedicated polyethylene tubing. Prior to the collection of the groundwater samples, approximately 3 to 5 well volumes were purged and stored in a 55-gallon DOT-approved drum. Groundwater samples were then placed into two (2) 40-milliliter (mL) vials, labeled and maintained at 4 degrees Celsius in a cooler. In addition, groundwater samples from groundwater sampling probes GP-9 and GP-10 were placed into 1,000-mL amber jars. Following the completion of each groundwater sampling probe, the location was surveyed and noted on the sampling plan.

Groundwater sampling probe GP-1 was installed at the location of soil probe GP-1 and sampled at the water table and then at 10-foot intervals below the water table to 60 feet below the ground surface. Groundwater sampling probes GP-2 and GP-3 were installed immediately downgradient of the former drywell. Groundwater sampling probes GP-2 and GP-3 were sampled at the water table and then at 20-foot intervals below the water table to approximately 77 feet below ground surface.

Groundwater sampling probes GP-4 through GP-7 were installed at the locations of soil probes GP-4 through GP-7, respectively. Groundwater samples were collected from each probe at the water table only.

Groundwater sampling probe GP-8 was installed along the northern (upgradient) property boundary, upgradient of the former drywell. Groundwater samples were collected from GP-8 at the water table and then at 20-foot intervals to a depth of approximately 80 feet below ground surface.

Groundwater sampling probes GP-9 and GP-10 were installed along the southern exterior wall of the building. The purpose of these groundwater sampling probes was to characterize the groundwater quality downgradient of a suspect underground storage tank located inside the building. Groundwater samples were collected from these points at the water table only.

Groundwater sampling probes GP-11, GP-12 and GP-13 were installed in a vacant parcel located downgradient of the subject property. The purpose of these groundwater sampling probes was to characterize groundwater quality downgradient of the Site. Groundwater samples were collected from these sampling points at the water table and then 20-foot intervals to a depth of approximately 60 feet below the water table.

5.3 Monitoring Wells

Groundwater samples were obtained from monitoring wells FN-1 through FN-4. The purpose for this groundwater sampling was to obtain the current groundwater quality in the immediate vicinity of the former drywell.

Prior to the sampling of the monitoring wells, each well was monitored for the depth to product and depth to water utilizing a Solinst® Oil/Water Interface Probe. No evidence of separate-phase product was identified in monitoring wells FN-1 through FN-4. Prior to sample collection, each monitoring well was purged of three (3) to five (5) well volumes utilizing a submersible pump.

Representative groundwater samples were obtained from each monitoring well utilizing dedicated polyethylene bailers. The groundwater

samples were placed into pre-cleaned 40-milliliter (ml) vials and maintained at 4 degrees Celsius in a cooler filled with ice.

5.4 Subsurface Drainage Structures

Sediment samples were obtained from drywells DW-1 through DW-6 and DW-8 utilizing a decontaminated hand auger.[1] Representative sediment samples were obtained from zero to 2 feet below the top of the sediment and separate aliquots of each soil sample were placed directly into pre-labeled zip-lock bags and 4 ounce jars. The zip-lock bags were allowed to sit for 5 minutes prior to field characterization by an F&N geologist. The 4-ounce jars were placed directly into a cooler filled with ice and maintained at 4 degrees Celsius.

5.5 Sample Analyses

Each soil, sediment and groundwater sample was transmitted to Chemtech, a State-certified laboratory (NYSDOH Certification Number 11376), under proper chain of custody procedures and analyzed for VOCs under CLP methodologies in accordance with ASP Protocol 95-1. In addition, the groundwater samples from groundwater sampling probes GP-9 and GP-10 were also analyzed for SVOCs in accordance with ASP Protocol 95-2.

Appendix D provides copies of the laboratory reports.

5.6 Field/Trip Blanks

Field blanks and trip blanks were appropriately prepared during the investigation. One (1) field blank was prepared for each matrix sampled on each day. The purpose of the field blanks was to verify the decontamination

[1] Drywell DW-8 was identified during the fieldwork and incorporated into the Work Plan.

procedures for all sampling equipment. Trip blanks were prepared by the laboratory for each day's fieldwork. The purpose of the trip blanks was to verify the shipping and handling procedures to the laboratory.

5.7 Matrix Spike/Matrix Spike Duplicates

As per the Work Plan and ASP protocol, matrix spike (MS) and matrix spike duplicate (MSD) analyses were performed on select soil, sediment and groundwater samples. The purpose of the MS & MSD analyses was to verify the accuracy of the laboratory results.

5.8 Potable Well Survey

A potable water well survey was performed to a radius of two (2) miles from the site. A public well database search was performed to identify all municipal water wells within the search area. In addition, a Freedom of Information Act request was submitted to the NYSDEC for all copies of Well Completion Forms for all private potable wells within the search area.

5.9 Human Health Exposure Assessment

A Human Health Exposure Assessment (Exposure Assessment) was prepared associated with specific Areas of Concern (AOCs) at the Site. The AOCs at the site are identified as VOCs in on-site soil (AOC-1), VOCs in sediment within on-site drywells (AOC-2), an on-site dissolved VOC groundwater plume (AOC-3) and an off-site dissolved VOC groundwater plume (AOC-4).

The purpose of the Exposure Assessment is to evaluate potential exposure pathways and the potential for health risks to humans from specific chemicals of

concern (COCs) within each AOC. The potential for human exposure to the COCs was evaluated based upon present land use of the property and anticipated future land use of the property.

6.0 DISCUSSION OF RESULTS

6.1 Field Activities

All sampling activities proposed in the Work Plan were performed with the following exceptions:

- The sampling of a suspect floor drain located inside the facility could not be performed because efforts to locate the floor drain were unsuccessful. Therefore, the NYSDEC indicated that no additional work was required for the investigation of the suspect floor drain.

- Several soil samples from soil probes GP-4 through GP-7 were broken during transit to the laboratory. Therefore, these soil probes were reinstalled in the presence of the NYSDEC.

Appendix E provides copies of F&N field notes.

6.2 Data Usability Summary Report

A Data Usability Summary Report (DUSR) was prepared for all analyticals. The DUSR report was prepared in order to verify that the analytical data generated for the investigation was not compromised.

The results of the DUSR indicate that the required Quality Control (QC) sampling was collected and all samples reached the laboratory and were analyzed within their required hold times. All of the QC samples were analyzed at the same time as the field samples and the analytical instrumentation was calibrated prior to analysis. Continuing Calibration Verification samples were analyzed during the course of field sample analyses to maintain analytical integrate during each sample run.

Problems noted in three (3) of the results packages. In each case, the problems did not impact the quality or integrity of the analytical results. None of the laboratory analyticals were rejected.

Appendix F provides copies of the DUSR Report.

6.3 Soil Probes

The soil encountered during the soil probe portion of the investigation was found to consist of dark to light brown, medium to fine grained silty sand. None of the soil samples were found to exhibit any visual or olfactory evidence of contamination.

Table 1 provides the PID screening results of the soil samples. As **Table 1** indicates, trace to no detectable levels of organic vapors were identified in the soil samples. The following breakdown provides the soil samples that contained detectable levels of organic vapors.

Sampling Location	Sample Depth (ft)	PID Result (ppm)
GP-1	0 - 2	5.5
	2 - 4	12.7
	6 - 8	1.1
GP-4	0 - 2	2.5
	2 - 4	5.7
	4 - 6	7.8
	6 - 8	9.5
	8 - 10	10.2
	10 - 12	7.2
	12 - 14	7.5
GP-5	0 - 2	5.7
	2 - 4	6.5
	4 - 6	7.2
	6 - 8	8.2
	8 - 10	5.2
	10 - 12	2.8
	12 - 14	5.8
GP-6	0 - 2	2.1
	2 - 4	4.2
	4 - 6	2.3
	6 - 8	7.5
	8 - 10	7.1
	10 - 12	2.5
	12 - 14	7.5
GP-7	4 - 6	4.2
	6 - 8	3.2
	10 - 12	7.2
	12 - 14	3.2

Tables 2 through **6** provide the results of the 95-1 analyses of each soil sample. The concentrations in **Tables 2** through **6** are reported in micrograms per kilogram (µg/kg).

A review of **Table 2** indicates that the compound Methylene Chloride was identified in the zero to 2 foot (2.4 µg/kg), 2 to 4 foot (1.9 µg/kg) and 6 to 8 foot samples (2.0 µg/kg) from soil probe GP-1. The concentrations of Methylene

Chloride are estimated since they were identified below the method detection limit. The estimated concentrations of Methylene Chloride are less than its respective TAGM Recommended Cleanup Objective. [2]

A review of **Table 3** indicates that the compound Trichloroethene was identified in the zero to 2-foot sample (1.4 µg/kg) and Tetrachloroethene was identified in the zero to 2-foot (4.8 µg/kg) and 4 to 6 foot (1.4 µg/kg) samples from soil probe GP-4. The concentrations of both Trichloroethene and Tetrachloroethene are estimated since they were identified below the method detection limit. The estimated concentrations of Trichloroethene and Tetrachloroethene are less than their respective TAGM Recommended Cleanup Objective.

A review of **Table 4** indicates that the compound Tetrachloroethene was identified in the 2 to 4 foot (4.5 µg/kg), 8 to 10 foot (3.3 µg/kg) and 10 to 12 foot (1.9 µg/kg) samples from soil probe GP-5. The concentrations of Tetrachloroethene are estimated since they were identified below the method detection limit. The estimated concentrations of Tetrachloroethene are less than its respective TAGM Recommended Cleanup Objective.

A review of **Table 5** indicates that the compound Trichloroethene was identified in the zero to 2-foot (1.3 µg/kg) sample and Tetrachloroethene was identified in the zero to 2-foot (2.7 µg/kg), 2 to 4 foot (4.6 µg/kg), 4 to 6 foot (6.1 µg/kg) and 8 to 10 foot (1.6 µg/kg) samples from soil probe GP-6. The concentrations of both Trichloroethene and Tetrachloroethene are estimated since they were identified below the method detection limit. The concentrations

[2] NYSDEC TAGM #4046 – January 24, 1994.

of Trichloroethene and Tetrachloroethene are less than their respective TAGM Recommended Cleanup Objectives.

A review of **Table 6** indicates that the compound Tetrachloroethene was identified in the zero to 2 foot (1.4 µg/kg), 4 to 6 foot (5.3 µg/kg) and 8 to 10 foot (8.3 µg/kg) samples from soil probe GP-7. The concentrations of Tetrachloroethene are estimated since they were identified below the method detection limit. The estimated concentrations of Tetrachloroethene are less than its respective TAGM Recommended Cleanup Objective.

Sheet 3 of 11 provides the total VOCs present in soil.
Sheet 4 of 11 provides the concentration of Tetrachloroethene in soil.
Sheet 5 of 11 provides the concentration of Trichloroethene in soil.

6.4 Groundwater Monitoring & Sampling

Table 7 provides the results of the groundwater monitoring of monitoring wells FN-1 through FN-4. As **Table 7** indicates, the depth to water beneath the Site ranges from 14.75 feet in monitoring well FN-1 to 15.50 feet in monitoring well FN-3.

Based upon the groundwater monitoring, a groundwater gradient map depicting the groundwater flow direction beneath the Site was prepared. The groundwater flow direction was determined utilizing computerized contouring software. The groundwater flow direction beneath the northeast portion of the Site was found to be toward the south-southeast.

Sheet 6 of 11 provides the groundwater gradient map for August 8, 2000

Tables 8 through **20** provide the results of the 95-1 analyses for the groundwater samples. The concentrations in **Tables 8** through **20** are reported in micrograms per liter (µg/L).

Groundwater Probe GP-1

A review of **Table 8** indicates the following compound was identified in GP-1 at concentrations exceeding NYSDEC Technical and Operational Guidance Series (TOGS) Groundwater Quality Standards[3]:

Depth	Compound	Concentration	GW Standard
24 feet	Methylene Chloride	5.9 µg/L*	5 µg/L
34 feet	Methylene Chloride	5.3 µg/L*	5 µg/L

* . . . Estimated value

No other compounds were identified in any of the samples from GP-1 at concentrations exceeding TOGS Groundwater Quality Standards. Methylene Chloride was identified in several trip blanks and several field blanks. Therefore, the levels of Methylene Chloride identified in the groundwater samples from GP-1 may have their source from a location other than the Site.

[3] NYSDEC Division of Water TOGS 1.1.1, June 1998.

Groundwater Probe GP-2

A review of **Table 9** indicates that the following compounds were identified in GP-2 at concentrations exceeding TOGS Groundwater Quality Standards:

Depth	Compound	Concentration	GW Standard
14 feet	Chloroethane	80 µg/L	5 µg/L
	1,1-Dichloroethane	170 µg/L	5 µg/L
	1,1,1-Trichloroethane	33 µg/L	5 µg/L
	Toluene	10 µg/L	5 µg/L

No other compounds were identified in any of the samples from GP-2 at concentrations exceeding TOGS Groundwater Quality Standards. The compounds Chloroethane and 1,1-Dichloroethane are degradation products of 1,1,1-Trichloroethane.

Groundwater Probe GP-3

A review of **Table 10** indicates that the following compounds were identified in GP-3 at concentrations exceeding TOGS Groundwater Quality Standards:

Depth	Compound	Concentration	GW Standard
14 feet	Chloroethane	190 µg/L	5 µg/L
	Acetone	51 µg/L	50 µg/L
	1,1-Dichloroethane	45 µg/L	5 µg/L
	2-Butanone	140 µg/L	50 µg/L

54 feet	Chloroethane	12 µg/L	5 µg/L
	1,1-Dichloroethane	15 µg/L	5 µg/L
	1,1,1-Trichloroethane	5 µg/L*	5 µg/L
74 feet	Chloroethane	14 µg/L	5 µg/L
	1,1-Dichloroethane	21 µg/L	5 µg/L
	1,1,1-Trichloroethane	7.9 µg/L*	5 µg/L

* . . . Estimated value

No other compounds were identified in any of the samples from GP-3 at concentrations exceeding TOGS Groundwater Quality Standards. The compounds Chloroethane and 1,1-Dichloroethane are common degradation products of 1,1,1-Trichloroethane.

Groundwater Probe GP-4

A review of **Table 11** indicates that no compounds were identified in the sample from GP-4 at concentrations exceeding TOGS Groundwater Quality Standards.

Groundwater Probe GP-5

A review of **Table 12** indicates that the following compound was identified in GP-5 at concentrations exceeding TOGS Groundwater Quality Standards:

Depth	Compound	Concentration	GW Standard
14 feet	1,1,1-Trichloroethane	9.3 µg/L*	5 µg/L

* . . . Estimated value

No other compounds were identified in the sample from GP-5 at concentrations exceeding TOGS Groundwater Quality Standards.

Groundwater Probe GP-6

A review of **Table 13** indicates that the following compound was identified in GP-6 at concentrations exceeding TOGS Groundwater Quality Standards:

Depth	Compound	Concentration	GW Standard
14 feet	1,1,1-Trichloroethane	8.7 µg/L*	5 µg/L

* . . . Estimated value

No other compounds were identified in the sample from GP-6 at concentrations exceeding TOGS Groundwater Quality Standards.

Groundwater Probe GP-7

A review of **Table 14** indicates that the following compound was identified in GP-7 at concentrations exceeding TOGS Groundwater Quality Standards:

Depth	Compound	Concentration	GW Standard
14 feet	1,1,1-Trichloroethane	12 µg/L	5 µg/L

No other compounds were identified in the sample from GP-8 at concentrations exceeding TOGS Groundwater Quality Standards.

Groundwater Probe GP-8

A review of **Table 15** indicates that the following compound was identified in GP-8 at concentrations exceeding TOGS Groundwater Quality Standards:

Depth	Compound	Concentration	GW Standard
14 feet	Acetone	78 µg/L	50 µg/L

No other compounds were identified in the samples from GP-8 at concentrations exceeding TOGS Groundwater Quality Standards. As previously discussed, groundwater probe GP-8 was installed upgradient of the former drywell. The level of Acetone identified in groundwater probe GP-8 may be indicative of the groundwater quality entering the Site.

Groundwater Probes GP-9 through GP-12

A review of **Tables 16** through **19** indicate that no compounds were identified in the samples from GP-9, GP-10, GP-11 and GP-12 at concentrations exceeding TOGS Groundwater Quality Standards.

Groundwater Probe GP-13

A review of **Table 20** indicates that the following compound was identified in GP-13 at concentrations exceeding TOGS Groundwater Quality Standards:

Depth	Compound	Concentration	GW Standard
14 feet	1,1,1-Trichloroethane	18 µg/L	5 µg/L
74 feet	1,1,1-Trichloroethane	11 µg/L	5 µg/L

No other compounds were identified in the samples from GP-13 at concentrations exceeding TOGS Groundwater Quality Standards.

Tables 21 and **22** provide the results of the 95-2 analyses of the groundwater samples from groundwater sampling probes GP-9 and GP-10. The concentrations in **Tables 21** and **22** are reported in µg/L. A review of **Tables 21** and **22** indicate that no compounds were identified in either sample at concentrations exceeding TOGS Groundwater Quality Standards.

6.5 Monitoring Wells

Table 23 provides the results of the 95-1 analyses of the groundwater samples from monitoring wells FN-1 through FN-4. The concentrations in **Table 21** are reported in µg/L.

A review of **Table 23** indicates that the following compounds were identified in FN-1 through FN-4 at concentrations exceeding TOGS Groundwater Quality Standards:

Well	Compound	Concentration	GW Standard
FN-1	No compounds		
FN-2	No compounds		
FN-3	1,1-Dichloroethane	23 µg/L	5 µg/L
	1,1,1-Trichloroethane	50 µg/L	5 µg/L
FN-4	1,1,1-Trichloroethane	5.2 µg/L*	5 µg/L

* . . . Estimated value

No other compounds were identified in the samples from FN-1 through FN-4 at concentrations exceeding TOGS Groundwater Quality Standards.

Sheet 7 of 11 provides the concentrations of total VOCs in groundwater.
Sheet 8 of 11 provides the concentrations of 1,1,1-Trichloroethane in groundwater.
Sheet 9 of 11 provides the concentration of 1,1-Dichloroethane in groundwater.
Sheet 10 of 11 provides the concentrations of total SVOCs in groundwater.

6.6 Subsurface Drainage Structures

The sediment encountered in drywells DW-1 through DW-8 was found to consist of dark brown, medium to fine grained sand.

Table 24 provides the results of the 95-1 analyses for each drywell sample along with a comparison to the compounds' respective TAGM Recommended Cleanup Objective. The concentrations in **Table 24** are reported in µg/kg.

As **Table 24** indicates, the following compounds were identified in the drywells at concentrations exceeding their respective TAGM Recommended Cleanup Objective:

Drywell	Compound	Concentration	TAGM RSCO
DW-1	No compounds		
DW-2	Acetone	270 µg/kg	200 µg/kg
DW-3	No compounds		
DW-4	No compounds		
DW-5	No compounds		
DW-6	No compounds		
DW-7	No compounds		
DW-8	No compounds		

All compounds identified in the drywell samples are present at a concentration less than their respective TAGM Recommended Cleanup Objective.

Sheet 11 of 11 provides the total VOCs in the drywells.

6.7 Field/Trip Blanks

Field Blanks

The compound Methylene Chloride was identified in five (5) of the nine (9) field blanks analyzed via ASP 95-1. The concentrations of Methylene Chloride that were identified range from 2.3 µg/L to 5.7 µg/L. Each of the concentrations of Methylene Chloride was estimated since they were below the method detection limit. No other compounds were identified in the field blanks analyzed via ASP 95-1.

The compound Di-n-butylphthalate was identified in both field blanks analyzed via ASP 95-2. The concentration of Di-n-butylphthalate that was

identified is 2.1 µg/L. This concentration of Di-n-butylphthalate was estimated since it was below the method detection limit. No other compounds were identified in the field blanks analyzed via ASP 95-2.

Trip Blanks

The compound Methylene Chloride was identified in three (3) of the seven (7) trip blanks analyzed via ASP 95-1. The concentrations of Methylene Chloride that were identified range from 2.4 µg/L to 6.0 µg/L. Each of the concentrations of Methylene Chloride was estimated since they were below the method detection limit. No other compounds were identified in the trip blanks analyzed via ASP 95-1.

6.8 Matrix Spike/Matrix Spike Duplicates

All MS and MSD requirements were met with the following exceptions:

- Surrogate Recovery requirements were not met for sediment samples DW-3MSD.
- Toluene recovery requirements were not met for DW-3MS.
- Internal Standard Area requirements were not met for DW-3MS and DW-3MSD.
- Surrogate Recovery requirements were not met for soil sample 107GP-1-4MS and 107GP-1-4MSD.
- Surrogate Recovery requirements were not met for soil samples 107GP-4-2MS and 107GP-4-2MSD.

6.9 Summary of Soil Quality Results

An overall evaluation of the analytical results of the soil samples indicates that based upon the results of soil probes GP-4 through GP-7, the roof drains located along the eastern exterior wall of the building should not be considered a source of the chlorinated solvents at the Site. The results of soil probe GP-1 indicate that the prior remedial activities associated with the former drywell were successful in the removal of chlorinated solvents in soils at the Site. The former drywell should not be considered as a source of the chlorinated solvents at the Site. Based upon the overall results of the soil probes, no sources of chlorinated solvents are present in the soils at the Site.

6.10 Summary of Groundwater Quality Results

An overall evaluation of the analytical results of the groundwater samples obtained from both the thirteen (13) groundwater sampling probes and the four (4) monitoring wells indicates that a plume of dissolved chlorinated solvents is present beneath the northeast portion of the Site. This plume primarily consists of the compounds 1,1,1-Trichloroethane and its degradation products 1,1-Dichloroethane and Chloroethane. The presence of the degradation products indicates that the plume is aged and has undergone chemical breakdown. These chlorinated solvents are consistent with the historical chlorinated solvents identified at the Site.

The compound 1,1,1-Trichloroethane was identified at eighteen (18) of the sampling locations and in 42 of the groundwater samples analyzed. Eight (8) of the eighteen (18) samples that were found to contain 1,1,1-Trichloroethane contain levels exceeding the TOGS Groundwater Quality Standard for 1,1,1-

Trichloroethene of 5 µg/L. The maximum concentration of 1,1,1-Trichloroethane identified during the investigation is 50 µg/L in monitoring well FN-3.

The compound 1,1-Dichloroethane was identified at five (5) of the sampling locations and in 42 of the groundwater samples analyzed. Each of the five (5) samples contains 1,1-Dichloroethane at levels exceeding the TOGS Groundwater Quality Standard for 1,1-Dichloroethane of 5 µg/L. The maximum concentration of 1,1-Dichloroethane identified during the investigation is 170 µg/L in the 14-foot sample from groundwater sampling probe GP-2.

The compound Chloroethane was identified at four (4) of the sampling locations and in 42 of the groundwater samples analyzed. Each of the four (4) samples contains Chloroethane at levels exceeding the TOGS Groundwater Quality Standard for Chloroethane of 5 µg/L. The maximum concentration of Chloroethane identified during the investigation is 190 µg/L in the 14-foot sample from groundwater sampling probe GP-3.

The groundwater plume was found to extend vertically to a minimum depth of 74 feet below grade, as evidenced by the 21 µg/L of 1,1-Dichloroethane and 7.9 µg/L of 1,1,1-Trichloroethane identified in groundwater sampling probe GP-3. Groundwater sampling probe GP-3 is located approximately 57 feet to the southeast and downgradient of the former drywell. No detectable levels of VOCs were identified in the 91-foot sample from groundwater sampling probe GP-2. This result, combined with the results from groundwater sampling probe GP-3, indicates that the groundwater plume has not migrated vertically to a depth of 91 feet below grade.

The compound Methylene Chloride was identified in each of the groundwater samples obtained from groundwater sampling probe GP-1. However, the Methylene Chloride may have its source from a location other than the Site since it was identified in both field blanks and trip blanks.

Detectable levels of 1,1,1-Trichloroethane were identified in each sample obtained from groundwater sampling probe GP-13. The levels of 1,1,1-Trichloroethane ranged from 18 µg/L at the 14-foot sampling depth to 1.7 µg/L at the 54 foot sampling depth. This location is approximately 281 feet to the east-southeast and downgradient and crossgradient of the former drywell. No detectable levels of 1,1,1-Trichloroethane were identified in any of the samples collected from groundwater sampling probes GP-11 or GP-12, which are both located in excess of 200 feet to the southeast and downgradient of the former drywell.

The compound Acetone was identified in the 14-foot sample from groundwater sampling probe GP-8 at a concentration exceeding its TOGS Groundwater Quality Standard of 50 µg/L. As previously discussed, groundwater sampling probe GP-8 was installed upgradient of the former drywell.

Acetone was also identified in drywell DW-2. However, this drywell is located over 75 feet south and downgradient of GP-8. Furthermore, five (5) sampling locations between DW-2 and GP-8 do not contain Acetone. The presence of the Acetone in the 14-foot sample from groundwater sampling probe GP-8 is likely due to regional groundwater quality upgradient of the Site and likely does not have its source from the former drywell.

The two (2) groundwater sampling probes installed to address the suspect underground storage tank inside the building did not contain any VOCs or SVOCs at concentrations exceeding their respective TOGS Groundwater Quality Standards. Based upon these results, the suspect underground storage tank has not contributed to the groundwater plume beneath the Site.

6.11 Summary of Drywell Quality Results

An overall evaluation of the analytical results of the sediment samples obtained from the eight (8) drywells indicates that DW-2 is the only drywell that contains levels of VOCs at concentrations exceeding their respective TAGM Recommended Cleanup Objective. None of the other drywells contain VOCs at concentrations exceeding their respective TAGM Recommended Cleanup Objective.

6.12 Potable Well Survey

The results of the potable well survey identified ten (10) municipal potable wells at five (5) locations within two (2) miles of the Site. Six (6) of the wells are located downgradient of the Site and four (4) of the wells are located upgradient of the Site. The following breakdown provides the municipal potable well information.

Well Field Location	Dist/Dir	No. Wells
Circle Drive	1.55 miles NE	2
Twelfth Street	0.74 miles SE	4
Gordon Avenue #1	1.25 miles SE	1
Gordon Avenue #2	0.70 miles SE	1
Wyandanch Avenue	1.39 miles NE	2

According to the Suffolk County Water Authority, who owns and maintains the wells, one (1) of the wells at Twelfth Street has been out of service since May 1975, one (1) of the wells at Twelfth Street has been out of service since September 1999 and both wells at Wyandanch Avenue have been out of service since September 1999.

6.13 Human Health Exposure Assessment

Three (3) AOCs, AOC-1, AOV-2 and AOC-3, are present on-site. AOC-1 is characterized as vadose zone soil along the eastern exterior wall of the building and at the location of the former drywell in the northeast portion of the site. During the soil portion of the Voluntary Cleanup investigation, the soil was found to consist of dark to light brown, medium to fine grained silty sand.

AOC-2 is characterized as the sediment within seven (7) existing stormwater drywells, identified as DW-1 through DW-6 and DW-8 and within one (1) former stormwater drywell, identified as DW-7.

AOC-3 is characterized as a dissolved VOC groundwater plume beneath the northeast, eastern and southeast portions of the site. During the groundwater portion of the Voluntary Cleanup investigation, the depth to the water table within AOC-3 was found to be approximately fourteen (14) feet below grade.

AOC-4 is characterized as a dissolved VOCs groundwater plume that has migrated off-site. During the groundwater portion of the Voluntary Cleanup investigation, the depth to the water table within AOC-4 was found to be approximately fourteen (14) feet below grade.

The present on-site land use of AOC-1 through AOC-4 consists of industrial operations. It is anticipated that the future on-site land use of AOC-1 through AOC-4 will remain industrial.

The present off-site land use of AOC-1 through AOC-4 consists of industrial operations. A landfill is located adjacent to the east of the site. It is anticipated that the future off-site land use of AOC-1 through AOC-4 will remain industrial.

Identification of Chemicals of Potential Concern

Based upon soil, sediment and groundwater sampling results, several COCs are present in each AOC. COCs are defined as chemicals that are believed to be or have been identified within each AOC. The following compounds are the COCs identified in AOC-1:

- Methylene Chloride
- Trichloroethene
- Tetrachloroethene

The following compounds are the COCs identified in AOC-2:

- Methylene Chloride
- Acetone
- 2-Butanone
- Ethylbenzene
- Toluene
- o-Xylene
- m,p-Xylenes

The following compounds are the COCs identified in AOC-3 and AOC-4:

- Methylene Chloride
- 1,1,1-Trichloroethane
- Tetrachloroethene

- Chloroethane
- Toluene
- Carbon Disulfide
- 1,1-Dichloroethane
- cis-1,2-Dichloroethene
- 2-Butanone
- Carbon Tetrachloride
- bis (2-Ethylhexyl) phthalate

Identification of Exposure Pathways

Exposure pathways are reasonable ways that humans can be exposed to COCs. Exposure pathways were evaluated for each AOC based upon present on and off-site land use of the property and anticipated future on and off-site land use of the property.

The following pathways were identified for AOC-1:

1. Inhalation of fumes.
2. Direct absorption through skin.

The following pathway was identified for AOC-2:

1. Inhalation of fumes.

The following pathways were identified for AOC-3 and AOC-4:

1. Consumption of VOC-impacted groundwater through private/public water wells.
2. Inhalation of fumes.

Exposure Characterization

Exposure characterization reflects an integration of toxicity information for each COC with site-specific exposure pathways for each AOC. The exposure characterization is different for carcinogen COCs versus non-carcinogen COCs.

The classification of each COC as either a carcinogen or non-carcinogen was based upon the USEPA's Integrated Risk Information System Chemical Profile Reports (CPRs). Based upon the CPRs, the following COCs are classified as B2 – Probable Human Carcinogen:

- Methylene Chloride
- Carbon Tetrachloride
- Trichloroethene

The following COC is classified as C – Possible Human Carcinogen:

- 1,1-Dichloroethane

Carcinogenic slope factors are currently not available for 1,1-Dichloroethane. Therefore, the exposure risks calculated for 1,1-Dichloroethane were as a non-carcinogenic compound.

The remaining COCs are either classified as D – Not classifiable as to human carcinogenicity or do not have a classification.

Carcinogenic COCs

AOC-1: Inhalation of Fumes

In order to evaluate the risk associated with the inhalation of fumes from carcinogenic COCs, the protocol outlined in Sections 6.6.3 and 8.2.1 of the USEPA Risk Assessment Guidance for Superfund (RAGS) Volume I – Human Health Evaluation Manual was utilized. These sections of RAGS provide the

formulas for the estimation of cancer risk based upon intake (in milligrams per kilogram-day, or mg/kg-day) and a COC-specific slope factor. The cancer risk was prepared utilizing the maximum concentration of each carcinogenic COC and the maximum default values from RAGS.

The breakdown below provides the calculated cancer risk for the inhalation of fumes of each carcinogenic COC in soil. As the breakdown indicates, the calculated risk is low, on the order of one (1) in every 100. This low risk indicates that the potential risk should be considered negligible. It should be noted that there is currently no contact with the soil due to an asphalt surface. No Carbon Tetrachloride is present in AOC-1.

Cancer Risk Estimates for AOC-1
Inhalation of Fumes
Kean Street, West Babylon, NY

COC	Maximum Conc. (mg/kg)	CDI (mg/kg-day)	SF $(mg/kg\text{-}day)^{-1}$	Cancer Risk
Methylene Chloride	0.024	6.5×10^{-4}	7.5×10^{-3}	8×10^{-2}
Trichloroethene	0.0014	5.8×10^{-4}	6×10^{-3}	9×10^{-2}

mg/L . . . . Milligrams per liter.
mg/kg-day . . . Milligrams per kilograms per day
CDI . . . Chronic Daily Intake
SF . . . Slope Factor

AOC-1: Direct Absorption

In order to evaluate the risk associated with the direct absorption of carcinogenic COCs from soil, the protocol outlined in Sections 6.6.2 and 8.2.1 of RAGS were utilized. The cancer risk was prepared utilizing the maximum concentration of each carcinogenic COC and the maximum default values from RAGS.

The breakdown below provides the calculated cancer risk for the direct absorption of each carcinogenic COC in soil. As the breakdown indicates, the

calculated risk is significantly low, on the order of one (1) in every 10,000,000. This low risk indicates that the potential risk should be considered negligible. No Carbon Tetrachloride is present in AOC-1.

Cancer Risk Estimates for AOC-1
Direct Absorption of Soil
Kean Street, West Babylon, NY

COC	Maximum Conc. (mg/kg)	CDI (mg/kg-day)	SF $(mg/kg\text{-}day)^{-1}$	Cancer Risk
Methylene Chloride	0.024	1.3×10^{-9}	7.5×10^{-3}	1.8×10^{-7}
Trichloroethene	0.0014	7.7×10^{-10}	6×10^{-3}	1.3×10^{-7}

mg/L . . . . Milligrams per liter.
mg/kg-day . . . Milligrams per kilograms per day
CDI . . . Chronic Daily Intake
SF . . . Slope Factor

AOC-2: Inhalation of Fumes

In order to evaluate the risk associated with the inhalation of fumes from carcinogenic COCs from sediment within AOC-2, the protocol outlined in Sections 6.6.3 and 8.2.1 of RAGS were utilized. The cancer risk was prepared utilizing the maximum concentration of each carcinogenic COC and the maximum default values from RAGS.

The breakdown below provides the calculated cancer risk for ingestion of each carcinogenic COC in groundwater. As the breakdown indicates, the calculated risk is significantly low, on the order of one (1) in every 10,000. This low risk indicates that the potential risk should be considered negligible. No Carbon Tetrachloride or Trichloroethene are present in AOC-2.

Cancer Risk Estimates for AOC-2
Inhalation of Fumes
Kean Street, West Babylon, NY

COC	Maximum Conc. (mg/kg)	CDI (mg/kg-day)	SF $(mg/kg\text{-}day)^{-1}$	Cancer Risk
Methylene Chloride	0.024	6.5×10^{-4}	7.5×10^{-3}	8×10^{-2}

mg/L . . . . Milligrams per liter.
mg/kg-day . . . Milligrams per kilograms per day
CDI . . . Chronic Daily Intake
SF . . . Slope Factor

AOC-3 & AOC-4: Consumption of Impacted Groundwater

In order to evaluate the risk associated with the consumption of groundwater impacted with carcinogenic COCs, the protocol outlined in Sections 6.6.1 and 8.2.1 of RAGS were utilized. The cancer risk was prepared utilizing the maximum concentration of each carcinogenic COC and the maximum default values from RAGS.

The breakdown below provides the calculated cancer risk for ingestion of each carcinogenic COC in groundwater. As the breakdown indicates, the calculated risk is significantly low, on the order of one (1) in every 10,000. This low risk indicates that the potential risk should be considered negligible. No Trichloroethene is present in AOC-3.

Cancer Risk Estimates for AOC-1
Groundwater Ingestion
Kean Street, West Babylon, NY

COC	Maximum Conc. (mg/L)	CDI (mg/kg-day)	SF $(mg/kg\text{-}day)^{-1}$	Cancer Risk
Methylene Chloride	0.078	2.2×10^{-3}	0.0075	1.7×10^{-4}
Carbon Tetrachloride	0.029	8.3×10^{-4}	0.13	1.1×10^{-4}

mg/L . . . . Milligrams per liter.
mg/kg-day . . . Milligrams per kilograms per day
CDI . . . Chronic Daily Intake
SF . . . Slope Factor

It should be noted that the cancer risk was calculated without consideration of residents who spend a portion of their day outside the home (e.g. at work or on vacation).

AOC-3 & AOC-4: Inhalation of Fumes

In order to evaluate the risk associated with the inhalation of fumes from carcinogenic COCs from groundwater within AOC-3, the protocol outlined in Sections 6.6.3 and 8.2.1 of RAGS were utilized. The cancer risk was prepared utilizing the maximum concentration of each carcinogenic COC and the maximum default values from RAGS.

No direct soil-vapor concentrations are available for any carcinogenic COC. Therefore, the current maximum groundwater concentrations for each carcinogenic COC were utilized and it is assumed that any off gassing would result in a carcinogenic COC concentration lower than what is currently present in the soil.

The breakdown below provides the calculated cancer risk for ingestion of each carcinogenic COC in groundwater. As the breakdown indicates, the calculated risk is significantly low, on the order of one (1) in every 10,000,000. This low risk indicates that the potential risk should be considered negligible. No Trichloroethene is present in AOC-3.

Cancer Risk Estimates for AOC-3 for Inhalation of Fumes Kean Street, West Babylon, NY

COC	Maximum Conc. (mg/L)	CDI (mg/kg-day)	SF $(mg/kg\text{-}day)^{-1}$	Cancer Risk
Methylene Chloride	0.078	1.6×10^{-5}	7.5×10^{-3}	1.2×10^{-7}
Carbon Tetrachloride	0.029	1.1×10^{-5}	1.3×10^{-1}	8.6×10^{-5}

mg/L . . . . Milligrams per liter.
mg/kg-day . . . Milligrams per kilograms per day
CDI . . . Chronic Daily Intake
SF . . . Slope Factor

Non-Carcinogenic COCs

AOC-1: Inhalation of Fumes

The inhalation of fumes from COCs within AOC-1 would happen when laborers are exposed to COC vapors in excavations performed within the AOC. The maximum exposure duration of the laborers is expected to be eight (8) hours during a normal workday. A normal excavation project is typically less than one (1) week in duration. To evaluate the significance of occupational exposures to COCs in these types of excavations, the current levels of each COC were compared with Permissible Exposure Limits (PEL's) provided by the National Institute Of Safety and Health ("NIOSH"). A PEL is defined as the average airborne concentration of a chemical to which nearly all workers can be repeatedly exposed to during an eight (8) hour workday and a forty (40) hour workweek, without adverse health effects.

No direct soil-vapor concentrations are available for any COC. Therefore, the current maximum soil concentrations for each COC were utilized and it is assumed that any off gassing would result in a COC concentration lower than what is currently present in the soil. A comparison of the maximum concentration for each non-carcinogenic COC to its respective PEL is provided in the breakdown below. As the breakdown indicates, the maximum concentration

for each non-carcinogenic COC is orders of magnitude less than its respective PEL. Therefore, workers are not expected to be exposed to each COC at concentrations exceeding acceptable industry guidelines.

Maximum Non-Carcinogenic COC Concentrations vs. Respective PEL's for Inhalation of Fumes within AOC-1
Kean Street, West Babylon, NY

Non-Carcinogenic COC	Maximum Conc. (mg/kg)	PEL (mg/kg)
Tetrachloroethene	0.0083	100

mg/kg . . . Milligrams per kilogram.

AOC-1: Direct Absorption

The direct absorption of COCs within AOC-1 would happen when laborers are directly exposed to COCs in excavations performed within the AOC. To evaluate the significance of occupational exposures to COCs in these types of excavations, the current levels of each COC were compared with PEL's provided by NIOSH.

A comparison of the maximum concentration for each non-carcinogenic COC to its respective PEL is provided in the breakdown below. As the breakdown indicates, the maximum concentration for each non-carcinogenic COC is orders of magnitude less than its respective PEL. Therefore, workers are not expected to be exposed to each COC at concentrations exceeding acceptable industry guidelines.

Maximum Non-Carcinogenic COC Concentrations vs. Respective PEL's for Direct Absorption within AOC-1
Kean Street, West Babylon, NY

Non-Carcinogenic COC	Maximum Conc. (mg/kg)	PEL (mg/kg)
Tetrachloroethene	0.0083	100
Trichloroethene	0.0014	100

mg/kg . . . Milligrams per kilogram.

AOC-2: Inhalation of Fumes

The inhalation of fumes from COCs within AOC-2 would happen when laborers or other workers on-site are exposed to COC vapors in the vicinity of the drywells. To evaluate the significance of occupational exposures to COCs in this situation, the current levels of each COC were compared with PEL's provided by NIOSH.

No direct soil-vapor concentrations are available for any COC. Therefore, the current maximum soil concentrations for each COC were utilized. A comparison of the maximum concentration for each non-carcinogenic COC to its respective PEL is provided in the breakdown below. As the breakdown indicates, the maximum concentration for each non-carcinogenic COC is orders of magnitude less than its respective PEL. Therefore, workers are not expected to be exposed to each COC at concentrations exceeding acceptable industry guidelines.

Maximum Non-Carcinogenic COC Concentrations vs. Respective PEL's for Inhalation of Fumes within AOC-2
Kean Street, West Babylon, NY

Non-Carcinogenic COC	Maximum Conc. (mg/kg)	PEL (mg/kg)
Acetone	0.270	1,000
2-Butanone	0.063	200
Ethylbenzene	0.014	100
Toluene	0.036	200
o-Xylene	0.039	100
m,p-Xylenes	0.039	100

mg/kg . . . Milligrams per kilogram.

AOC-3 & AOC-4: Consumption of Impacted Groundwater

In order to evaluate the risk associated with consumption of groundwater impacted with non-carcinogenic COCs, the protocol outlined in Sections 6.6.1 and 8.2.1 of the USEPA RAGS was utilized to estimate the noncancer hazard

quotient. The noncancer hazard quotient was calculated utilizing the exposure level for each non-carcinogenic COC and each non-carcinogenic COC Reference Dose (RfD).

Each non-carcinogenic COCs noncancer hazard quotient is provided in the breakdown below. As the breakdown indicates, the level of exposure is less than unity; therefore, there should be no concern for potential noncancer effects. The USEPA has withdrawn the RfD for 1,1,1-Trichloroethane.

Noncancer Hazard Quotients for Non-Carcinogenic COCs within AOC-3 & AOC-4
Kean Street, West Babylon, NY

Non-Carcinogenic COC	Exposure Level	RfD	Noncancer Hazard Quotient
Tetrachloroethene	3.7×10^{-5}	1×10^{-2}	3.7×10^{-3}
Acetone	1.5×10^{-3}	1×10^{-1}	1.5×10^{-2}
Chloroethane	RfD Not Available		
Toluene	2.9×10^{-4}	2×10^{-1}	1.4×10^{-3}
Carbon Disulfide	5.1×10^{-5}	1×10^{-1}	5.1×10^{-4}
1,1-Dichloroethane	4.9×10^{-3}	1×10^{-1}	4.9×10^{-2}
cis-1,2-Dichloroethene	1×10^{-2}	1×10^{-2}	1×10^{-2}
2-Butanone	4×10^{-3}	6×10^{-1}	6.7×10^{-3}

AOC-3 & AOC-4: Inhalation of Fumes

The inhalation of fumes from COCs within AOC-3 and AOC-4 would happen when either laborers or other workers are exposed to COC vapors in the vicinity of the drywells, or as a result of off gassing of COCs through the vadose zone. To evaluate the significance of occupational exposures to COCs in this situation, the current levels of each COC were compared with PEL's provided by NIOSH.

No direct soil-vapor concentrations are available for any COC. Therefore, the current maximum soil concentrations for each COC were utilized. A

comparison of the maximum concentration for each non-carcinogenic COC to its respective PEL is provided in the breakdown below. As the breakdown indicates, the maximum concentration for each non-carcinogenic COC is orders of magnitude less than its respective PEL. Therefore, workers are not expected to be exposed to each COC at concentrations exceeding acceptable industry guidelines.

Maximum Non-Carcinogenic COC Concentrations vs. Respective PEL's for Inhalation of Fumes within AOC-3 & AOC-4
Kean Street, West Babylon, NY

Non-Carcinogenic COC	Maximum Conc. (mg/L)	PEL (mg/kg)
1,1,1-Trichloroethane	0.05	100
Tetrachloroethane	0.0013	100
Acetone	0.051	1,000
Chloroethane	0.19	1,000
Toluene	0.001	200
Carbon Disulfide	0.0018	20
1,1-Dichloroethane	0.045	100
cis-1,2-Dichloroethene	0.0035	200
2-Butanone	0.14	200

mg/kg . . . Milligrams per kilogram.

7.0 CONCLUSIONS

Based upon the findings of the investigation presented in Sections 2.0 to 6.0 above, F&N provides the following conclusions:

- No soil is present at the Site that contains levels of chlorinated solvents at concentrations exceeding their respective TAGM Recommended Cleanup Objectives. Therefore, no soils at the Site require additional investigation/remediation.

- The results of prior F&N environmental activities have proven successful in the remediation of the former drywell at the Site. Based upon the results of this investigation, no additional source(s) of chlorinated solvents are present at the Site.

- The groundwater flow direction beneath the Site is toward the southeast. This groundwater flow direction is consistent with historical flow directions.

- Groundwater beneath the northeast portion of the Site contains levels of chlorinated solvents at concentrations exceeding their respective TOGS Groundwater Quality Standard. The chlorinated solvents consist of 1,1,1-Trichloroethane and its degradation products 1,1-Dichloroethane and Chloroethane.

- The suspect underground storage tank has not contributed to the groundwater plume beneath the Site.

- The maximum total VOC concentration in groundwater beneath the Site is 437.1 µg/L. This concentration is present in groundwater sampling probe GP-3.

- Evidence of degraded groundwater quality was identified both upgradient of the Site, as evidenced by the Acetone identified in groundwater sampling probe GP-8.

- Drywell DW-2 contains Acetone at a concentration exceeding its TAGM Recommended Cleanup Objective. No other VOCs were identified in the remaining drywells at concentrations exceeding their respective TAGM Recommended Cleanup Objective. Therefore, all drywells with the exception of DW-2 do not require additional investigation/remediation.

- The results of the Human Health Exposure Assessment indicates that based upon the current soil and groundwater quality, low to significantly low cancer risks are present associated with carcinogenic chemicals and there is no concern for potential noncancer effects.