Site Sampling and Investigation Plan

Joan's Cleaners

Tabernacle Township, New Jersey

Remedial Investigation and Remedial Action Selection

Term Contract No. A-73073

Submitted to:

STATE OF NEW JERSEY
Department of
Environmental Protection
Site Remediation Program
Bureau of Investigation,
Design and Construction
401 East State Street,
Trenton, New Jersey 08625

Submitted by:

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1.0 PROJECT DESCRIPTION

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The Louis Berger Group, Inc. (Berger) has been contracted by the New Jersey Department of Environmental Protection (NJDEP) to perform site-specific Remedial Investigations (RI) and Remedial Action Selections (RAS) at multiple sites throughout the state (NJDEP Term Contract A-73073). The site to be investigated under this Site Sampling and Investigation Plan (SSIP) is the Joan's Cleaners (Site), located in Tabernacle Township, Burlington County, New Jersey (Figure 1).

The SSIP is supplemented by information presented in the *Programmatic Quality Assurance Program Plan* (QAPP) (Berger, November 1998), the *Program Health and Safety Plan* (HASP) (Berger, June 2005) and the *Site Specific Health and Safety Plan* (SSHASP). All sampling and investigation activities described in the SSIP will be performed in accordance with *The New Jersey Technical Requirements for Site Remediation NJAC 7:26E* (NJDEP, 2008), *The NJDEP Field Sampling Procedures Manual* (NJDEP, 2005) and any additional State and Federal regulations. The following subsections present the scope and objectives of the RI, staff responsibilities, an overview of the history and current status of the site, and a summary of previous site investigations.

1.1 SCOPE AND OBJECTIVES

Groundwater sampling conducted by the NJDEP has indicated levels of volatile organic compounds (VOCs) in exceedance of safe drinking water standards in a residential neighborhood near the Site and further investigations have identified the Site to be a potential source for this contamination. While onsite and offsite investigations have been performed, vertical and horizontal delineation of the plume has not been completed. These data gaps and a proposed approach to investigating this Site were presented in the Conceptual Approach (Berger, February 2009). This SSIP has been prepared in accordance with the Conceptual Approach and NJDEP comments and a site inspection held with the NJDEP and Berger project teams.

The SSIP scope development included a review of background files and data from previous investigations and provides site background information, a physical description of the Site, the current understanding of the nature and extent of site-related contamination, and an assessment of existing data gaps. The remedial investigations objectives to fill those data gaps are as follows:

- Confirm and delineate the source(s) of contamination;
- Characterize site geologic and hydrogeologic conditions;
- Characterize the groundwater flow regime;

- Assess groundwater quality and delineate the extent of groundwater contamination using Class I-PL (Protection Area) criterion;
- Identify potential contaminant impacts to surrounding surface water; and
- Evaluate potential effects to human receptors and natural ecological resources.

In an effort to accomplish these objectives the following activities are planned:

- Additional File Review and Site Inspection,
- Geophysical Investigation,
- Soil Investigation,
- Groundwater Screening,
- Monitoring Well Installation and Sampling,
- Surface Water and Sediment Investigation, and
- Receptor Evaluation

1.2 PROJECT ORGANIZATION

Mr. Larry Quinn is the Case Manager and primary point of contact for the NJDEP. He will be responsible for coordination of all NJDEP activities related to this project. To meet the investigative objectives and goals as stated in Section 1.0, Berger has assembled a project-specific management team drawn from the approved program staffing list submitted to the NJDEP for Term Contract A-73073. This staff will be responsible for the planning, implementation, and reporting of all remedial investigations conducted by Berger at the Site. Berger staffing for this project is listed as follows:

PROGRAM MANAGER	Richard Harding
PROJECT MANAGER	Christopher Watt, P.G.
RI TASK LEADER	James McGarry, P.E.
LABORATORY DATA COORDINATOR	Joseph Nelson
GROUP HEALTH AND SAFETY COORDINATOR	Brian Murphy, CIH

As Program Manager for Berger, Mr. Harding will have the overall responsibility, authority, and accountability for the project. He will function as the primary interface between the NJDEP, project management, subcontractor management, and the project team. In executing these duties, he will:

- Have responsibility for meeting all contractual requirements for the task;
- Administer and supervise all contractual requirements for the task;
- Direct formulation of work plans in accordance with client directions;

- Have responsibility for ensuring that required staffing levels and technical expertise are provided;
- Keep the NJDEP project manager informed on all aspects of the program, including expenditures, progress, problems and recommended solutions;
- Keep project management informed on all matters relating to the program; and
- Review technical project outputs prior to issue.

As Project Manager, Mr. Watt will be responsible for organizing and directing the technical activities of the project and for reporting the results of these activities. The Project Manager will assign broad areas of responsibility to technical managers and monitor their progress, assist in technical analysis, trouble shoot problems, revise plans as conditions change, and provide quality control review of project deliverables. He will be the primary point of contact between NJDEP and Berger and have day-to-day interaction with the technical staff.

Mr. McGarry will serve as the RI Task Leader. In this capacity, he will work with the Project Manager to plan and execute the SSIP, SSHASP, and assure that all site related tasks are performed in compliance with the QAPP. Under the direction of the Project Manager he will plan, schedule, organize, initiate, and oversee project tasks. Mr. McGarry's duties will include oversight of field sample teams; guidance for the subsurface investigation; real-time decisions-making where field activities require adjustments; assurance that QC procedures and safety plans are understood and executed; and coordination of subcontractor tasks.

Mr. Nelson will serve as the Laboratory Data Coordinator, and will work with the Project Manager to set up the laboratory QA program for the project and monitor that program to ensure that it is properly executed. He will mediate between the field personnel and the lab and will oversee preservation and storage, transportation, laboratory analysis of the samples, and data validation to ensure that the specifications and acceptance criteria are met for the data collected. Field and laboratory audits will be conducted to ensure adherence to the standard operating procedures set forth in the plan.

Mr. Murphy will serve as the Corporate Health and Safety Coordinator. As such, he will be responsible for all record keeping associated with appropriate health and safety training, general certifications and medical clearance documentation for Berger's field personnel. It will be the responsibility of the Project Manager and the RI Task Leader, with the assistance of Mr. Murphy, to oversee and carry out activities in accordance with the PHASP and SSHASP.

1.3 SITE HISTORY AND PREVIOUS INVESTIGATIONS

This subsection presents a summary of the background information associated with the Site including a brief history of past operations and previous environmental investigations.

Joan's Cleaners was a dry cleaning facility that operated within a strip mall between 1983 and 2005. The space that was occupied by Joan's Cleaners is presently is a Subway restaurant. The strip mall is serviced by one shared septic system and one common well, which is believed to be drilled to a depth of 55 feet below ground surface (bgs). The original installation date of the septic system is unknown; however, the system was replaced in 1988 and again in 2005. NJDEP records indicate that Joan's Cleaners utilized tetrachloroethylene (PCE) for the entire period that the business was in operation. According to manifests, between April 1988 and December 1994, approximately 3,300 lbs of waste solvent was disposed of offsite. There are no records indicating that any waste solvents were removed from the Site before April 1988 or after December 1994.

A 1,000 gallon underground storage tank (UST) that contained fuel oil was removed from the strip mall property in January 2005. Soil contamination was discovered during the UST removal activities and the contamination was remediated. Post excavation soil sample results were all below the NJDEP's Soil Cleanup Criteria (SCC) and according to reports, ground water was not impacted. The NJDEP issued a No Further Action (NFA) letter on August 9, 2005. There is presently an active 575 gallon above ground fuel oil storage tank at the strip mall property.

In March 2006, groundwater contamination was detected in a private well northeast and down-gradient of the Site. Based on NJDEP correspondence, private wells in that neighborhood are typically screened in the Cohansey aquifer between 40 and 70 feet bgs. The NJDEP and the local health department have sampled over 70 of the private wells in the area and PCE and derivative chlorinated products, such as trichloroethene (TCE) and cis-1,2 Dichloroethene, were present in groundwater samples collected from approximately 30 of the wells. Figure 2 indicates the blocks and lots of the properties that exhibited groundwater exceedances for PCE. The gasoline additive methyl tert-butyl ether (MTBE) was also present in several of the groundwater samples collected from the private wells. Point of entry treatment units (POETS) were provided to all of the impacted private wells.

A Sunoco station, formerly known as Highway Petroleum Inc. (HPI), is situated directly across Route 206 from the Site. The HPI site is identified as a Known Contaminated Site (KCS) by the NJDEP. In May 1999, seven USTs were removed from HPI. According to NJDEP reports, some or all of the USTs released gasoline and 176 tons of contaminated soil were removed from the HPI Site and three groundwater monitoring wells were installed. In October 2002, PCE was

detected at a concentration of 114 parts per billion (ppb) in one of the HPI monitoring wells. In a June 2007 sampling event, the PCE concentration was 1.4 ppb. In August 2000, MTBE was detected in groundwater at HPI at a concentration of 7.48 ppb. In June 2007 the MTBE concentration was 1 ppb.

In May 2006, the NJDEP performed groundwater screening at 10 locations at and near the Joan's Site. A total of 37 groundwater samples were collected; concentrations of four of the samples exceeded the NJDEP Class-IIA groundwater quality standards (GWQS) for PCE and concentration of one of the groundwater samples exceeded the GWQS for TCE. Three of the groundwater samples with only PCE exceedances were collected from 21 to 24 feet bgs. The one groundwater sample with both PCE and TCE exceeding the NJDEP criteria was collected from 57 to 60 feet bgs. A sample collected at the same location from the 69 to72 foot interval did not exceed the criteria for either PCE or TCE.

In July 2006, the NJDEP performed groundwater screening at 18 locations within the Site as well as up-gradient and down-gradient of the Site. Eighteen groundwater samples were collected from varying intervals ranging from the water table to a depth of 72 feet bgs, and the concentrations of five of the samples exceeded the GWQS for PCE. Locations up-gradient to the Site did not exhibit groundwater concentrations above the GWQS; however, several down-gradient groundwater samples that were collected near the HPI property exhibited low levels of MTBE and BTEX compounds.

The NJDEP performed 20 borings in the neighborhood northeast of the Site in July 2007. From these 20 borings, 38 groundwater samples and 20 soil gas samples were collected. No soil gas samples exhibited concentrations above NJDEP screening levels; however, there were PCE and TCE exceedances of the GWQS as deep as 64 feet bgs, and MTBE exceedances of the GWQS as deep as 44 feet bgs. In March 2008, the NJDEP performed additional borings within the same neighborhood and PCE and MTBE exceedances were identified as deep as 52 feet bgs, and benzene exceedances were detected as deep as 44 feet bgs. Samples collected from the 60 to 64 foot bgs intervals did not contain concentrations above criteria.

2.0 SITE DESCRIPTION

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The Site is located within a strip mall at 1529 Route 206 (Block 320, Lot 5) in Tabernacle Township, Burlington County, New Jersey situated at approximately 39° 51' 12" north latitude and 74° 44' 3" west longitude. The Site is within the limits of the Pinelands Management Area (Pinelands), part of the Pinelands National Reserve. Figure 1 is an annotated U.S.G.S. 7.5-minute quadrangle (Indian Mills and Medford Lakes, NJ 1981) showing the Site's location, local topography, surface water, and cultural features. The property was used as a dry cleaning facility from 1983 to 2005, and is presently a Subway Restaurant. The Site is surrounded by residential and commercial properties and is currently owned by HAAS Plaza, LLC. Figure 2 is a site plan showing the Site property and the surrounding area.

2.1 TOPOGRAPHY

The Site is located within the Atlantic Coastal Plain Physiographic Province, which is typically characterized by low-relief terraces underlain by marginal marine sediments. The topography is relatively flat, with an elevation of approximately 120 feet above mean sea level (amsl). Surface elevations within the neighborhood to the northeast of the Site range from 118 ft amsl near the Site to 100 feet amsl to the northeast.

2.2 GEOLOGY AND SOILS

According to a NJDEP *Site Investigation Report* (September 2006) soils at the Site and in the surrounding area are of the Evesboro series which consists of deep, loose, excessively drained sands. The NJDEP performed several soil borings at the Site, these borings were advanced to 20 feet bgs and indicated poorly sorted yellow-orange fine to medium sands. The USGS *Surfical Geologic Map of Central and Southern New Jersey* classifies soil at the Site as Colluvium and Alluvium (Pleistocene) consisting of poorly sorted, quartz rich, sand, gravel, silt and clay. The unit is generally less than 6 feet thick but may range up to 25 feet.

Based on the *Bedrock Geologic Map of Central and Southern New Jersey* (Owens et al., 1998), the Cohansey Formation underlies the Site. The Cohansey Formation is middle Miocene in age and is comprised of fine to coarse grained sand with local gravel and clay, and is underlain by the Kirkwood Formation, which is comprised of fine to medium grained sand and silty sand and is also middle to lower Miocene in age. The lowermost clay-silt layer of the Kirkwood Formation, termed the Asbury Clay or Asbury Park Member of the Kirkwood Formation, is a dark, peaty, massive to laminated clay-silt with occasional interbeds of fine sand and is typically

a few feet thick. The Cohansey and Kirkwood formations extend to a depth of approximately 150 feet bgs.

A confining layer of interbedded massive clays and silty clays consisting of the Shark River (upper middle Eocene), Manasquan (lower Eocene), Hornerstown (lower Paleocene) and Tinton (upper Cretaceous) Formations extends to a depth of approximately 400 feet bgs.

2.3 HYDROGEOLOGY

During past NJDEP investigations groundwater was encountered at approximately 20 feet bgs, and shallow groundwater flow was assumed to be northeast towards Bear Swamp and Bread and Cheese Run (USGS, 1995). The shallow aquifer at the Site is the Kirkwood-Cohansey aquifer system, which is comprised of predominantly highly permeable sand and is approximately 150 feet thick at the Site. Due to its location within the Pinelands, this aquifer system at the Site is classified as a Class I-PL Protection Area, with the primary designated use being the preservation of Pinelands plant and animal species and their habitats (NJAC 7:9-6 – NJDEP, 1993). Secondary designated uses of the aquifer include potable and agricultural water.

Below the Kirkwood-Cohansey aquifer and a 250 foot thick confining layer is the Mount Laurel-Wenonah aquifer, which is approximately 400 feet bgs. There are supply wells within 2 miles northeast of the Site that are screened in the Mount Laurel-Wenonah aquifer.

2.4 SURFACE WATER, DRAINAGE AND WETLANDS

The nearest surface water bodies are an unnamed creek that runs to Bear Swamp, located approximately 3,800 feet northeast of the Site, and Bread and Cheese Run, located 4,000 feet east of the Site. Both of these are tributaries of the South Branch of Rancocas Creek. The *New Jersey Surface Water Quality Standards* (N.J.A.C 7:9B) classify the South Branch of Rancocas Creek as PL (Pinelands Waters). Designated uses of Pineland Waters include the maintenance, migration and propagation of natural and established biota. There are deciduous wooded wetlands approximately 1,000 feet southeast of the Site and approximately 3,500 feet northeast of the Site (NJDEP Burlington County Wetland shape files). Figure 3 depicts the wetlands in the area.

3.0 NATURE AND EXTENT OF CONTAMINATION

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As discussed above, Joan's Cleaners was a dry cleaning facility that operated within a strip mall between 1983 and 2005. NJDEP records indicate that Joan's Cleaners utilized tetrachloroethylene (PCE) for the entire period that the business was in operation. The strip mall is serviced by a septic system that was replaced in 1988 and again in 2005. In March 2006, volatile organic compound (VOC) groundwater contamination was detected in a private well northeast and down-gradient of the Site. Based on NJDEP correspondence, private wells in that neighborhood are typically screened in the Cohansey aquifer between 40 and 70 feet bgs. The NJDEP and the local health department have sampled over 70 of the private wells in the area and PCE and derivative chlorinated products, such as TCE and cis-1,2 Dichloroethene, were present in the groundwater samples collected from approximately 30 of the wells. The following section presents a discussion of the current understanding of the potential sources, interpreted migration pathways and affected media, any potential receptors and identification of data gaps that need to be addressed.

3.1 POTENTIAL SOURCES AND MIGRATION PATHWAY

It is uncertain if there are any ongoing sources of contamination originating from the Site. The strip mall is serviced by a septic system that was replaced in 1988 and again in 2005. According to manifests, between April 1988 and December 1994, approximately 3,300 lbs of waste solvent was disposed of offsite. There are no records indicating that any waste solvents were removed from the Site before April 1988 or after December 1994. Soil samples collected from the historic septic system contained PCE concentrations below the applicable soil remediation standards. Beginning in 2006, nearby residential potable wells were investigated and found with concentrations of PCE and TCE above the GWQS. It is believed that PCE may have entered the subsurface through the septic system.

3.2 CONTAMINANT PATHWAYS AND AFFECTED MEDIA

Contaminants released at the Site would have initially affected the soil at the discharge point. Such discharges could have been introduced to groundwater through the soil column via gravity drainage enhanced by precipitation infiltration. It is assumed that groundwater generally flows to the northeast towards the wetland area.

3.3 POTENTIAL RECEPTORS

The primary potential receptors of the groundwater contamination are residents utilizing domestic wells and the wetland areas near the Site. The impacted residential properties immediately east and northeast of the Site that were identified through previous groundwater sampling were provided with POETS systems; however, the extent of groundwater contamination has not been determined and therefore the possibility of domestic well contamination still exists.

3.4 DATA GAPS

Potable well sampling conducted by the NJDEP has indicated levels of VOCs in exceedance of safe drinking water standards in a residential neighborhood near the Site. Further investigations have identified the Site to be a potential source for this contamination. While onsite investigations have been performed and groundwater sampling has been performed within the residential neighborhood, vertical and horizontal delineation of the plume has not been completed. The following objectives were developed to address the data gaps associated with this Site:

- Confirm and delineate the source(s) of contamination;
- Characterize site geologic and hydrogeologic conditions;
- Characterize the groundwater flow regime;
- Assess groundwater quality and delineate the extent of groundwater contamination using Class I-PL (Protection Area) criterion;
- Identify potential contaminant impacts to surrounding surface water; and
- Evaluate potential effects to human receptors and natural ecological resources.

4.0 REMEDIAL INVESTIGATION ACTIVITIES

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The following sections provide descriptions of the various field activities planned for the Remedial Investigation (RI). Task-specific sections detail the implementation of each field activity. A summary of all proposed field sampling is presented as Table 1.

All sampling and investigation activities will be performed in accordance with NJAC 7:26E; *New Jersey Technical Requirements for Site Remediation* (NJDEP, 2008), the *New Jersey Field Sampling Procedures Manual* (NJDEP, 2005), *Alternative Groundwater Sampling Techniques Guide* (NJDEP 1994), and, where applicable, other relevant regulation and guidance for conducting investigations at contaminated sites. The task-specific descriptions of planned field activities are supplemented by detailed procedures outlined in the *Programmatic Quality Assurance Program Plan* (QAPP). All field work will also be performed in accordance with the contract *Programmatic Health and Safety Plan* (HASP) and a *Site-Specific Health and Safety Plan* (SSHASP).

4.1 PUBLIC NOTIFICATION

In accordance with NJAC 7:26E-1.4, no later than two weeks prior to initiating the field activities associated with the remedial investigation, all of the sensitive populations and resources that are located within 200 feet of the site boundary and within the investigation area will be identified and recorded on a Sensitive Population and Resource Checklist. In addition, all property owners and tenants within 200 feet of the site boundary and within the investigation area will be notified a minimum of two weeks prior to the initiation of field activities. Berger will support the NJDEP Community Relations representative in developing all required letters, fact sheets and checklists for distribution as required by the regulation.

4.2 ADDITIONAL FILE REVIEW AND SITE INSPECTION

A review of the groundwater sampling data that was collected from the private wells may help to determine the screening depths of the wells and would facilitate in choosing the locations of future monitoring wells and groundwater screening locations. A cursory site inspection shall be conducted to determine if there are other areas of concern at the Site which may warrant additional soil and/or groundwater investigation. Furthermore, there are three Known Contaminated Sites (KCS) within one mile of the Site and further research may be needed to determine if these KCS are potential sources for some or all of the groundwater contamination.

4.3 GEOPHYSICAL INVESTIGATION

Geophysical investigations for the Site will include surface surveys to determine if potential subsurface structures and/or anomalies are present. An interpretation of all data and results will then be provided by the geophysical subcontractor and will be included as an appendix of the RI Report.

Surficial geophysical surveys will be conducted onsite to locate and orient the septic system and any other subsurface structures which may have acted as a source or preferential pathway for contamination. Additionally, surface surveys shall be used onsite and offsite and to clear sampling and monitoring well locations prior to any invasive subsurface activities. A Time-Domain EM survey will be conducted using an EM-31 high sensitivity detector (or equivalent), capable of detecting metal and non-metal anomalies at depths of 10 feet.

A combined EM, ground penetrating radar (GPR) survey and pipe locating survey will also be conducted at the proposed sampling locations and monitoring well locations. As subsurface anomalies are identified; they shall be marked out and recorded as appropriate, and then further investigated with more localized, focused GPR surveys as needed. The focused GPR surveys will be conducted over significant EM anomalies. The geophysical subcontractor will provide real-time onsite results regarding the clearance of all locations.

4.4 SOIL INVESTIGATION

An onsite soil investigation will consist of up to 25 soil boring locations to investigate and potentially delineate onsite soil contamination. Approximate locations of the initial six soil boring locations (SB01 – SB06) are shown on Figure 4 and will be used to investigate the septic system and garage area. Additional soil boring locations are dependent upon observations during the initial six borings and findings of the cursory Site inspection which may lead to additional areas of concern that warrant soil and groundwater investigations. Soil borings SB07 through SB25 shall be conducted to investigate additional areas of concern and/or to delineate contamination observed during the initial soil borings.

All soil borings will be advanced using direct push drilling methods and will be extended to a minimal depth equal to the bottom of the septic field or to the top of the water table, whichever is encountered first. If no evidence of contamination is observed, the boring will be extended to a depth of encountered silts, clays or impermeable zones. Based on previous NJDEP reports, a direct push drill rig has reached depths of 70 feet at or near the Site. Therefore, when necessary, soil borings will be extended to refusal which based on knowledge of direct push drilling in the area is expected to be approximately 80 feet bgs. If an impervious layer has not been identified

shallower than refusal, a hollow stem auger (HSA) or mud rotary drill rig will be necessary to reach depths up to 150 ft bgs which is the approximate depth of the known confining later.

During soil boring activities soils will be classified according to the Burmister Soil Classification System by a Berger Geologist/Scientist. Subsurface conditions will be recorded, including soil type/color, photoionization detector (PID) readings, depth to groundwater, contaminant observations/odors, and drilling specifications. All observations will be recorded and included as boring logs within the Remedial Investigation Report (RIR).

Up to two soil samples may be collected from each soil boring. One soil sample will be collected biased to the six-inch interval exhibiting the highest PID, observed contamination or the observed confining layer. If contamination is encountered, a second sample will be collected from a depth beneath the contamination in an effort to vertically delineate the contamination. In addition, if contamination is encountered at a soil boring location, additional borings shall be drilled and sampled radially outward in an effort to horizontally delineate the contamination.

All soil samples will be analyzed for Target Compound List (TCL) VOC+10, method SW846 8260 and selected soil samples will be analyzed for Total Organic Carbon (TOC), method SW846 9060M to establish a site specific soil remediation standard for impact to groundwater as well as to document if the VOCs are adhering to the organic soil layers.

In addition to soil samples, at least one groundwater sample shall be collected from the down gradient soil boring location at the septic tank (SB-01). The depth of the water sample shall coincide with the depth of encountered contamination; otherwise the sample shall be collected at the water table. Up to 10 additional groundwater samples may be necessary to investigate groundwater associated with areas of concern found during the cursory Site inspection. Onsite groundwater samples will be analyzed for TCL VOC+10, MTBE and TBA.

All soil cuttings will be returned to the boreholes unless deemed grossly contaminated. Soil that is deemed grossly contaminated will be containerized in 55-gallon drums and staged onsite or at an approved lot owned by Tabernacle Township, for transport and disposal at a certified disposal facility. Boreholes drilled deeper than 50 feet bgs shall require a permit and boreholes deeper than 25 feet are required to be backgrouted.

4.5 SEPTIC TANK SAMPLING

The septic tank that serves the strip mall is a potential source of contamination and shall be investigated. If obtainable, one aqueous sample and one sludge sample will be collected from the septic tank in accordance with NJAC 7:26E-3.9(e)3. The aqueous sample shall be collected using a Teflon® lined bailer and the sludge sample will be collected using a stainless steel sediment sampler or acetate liner. Each sample will be analyzed for TCL VOC+10, MTBE and TBA.

4.6 GROUNDWATER SCREENING

Groundwater screening techniques will be implemented to characterize the existing contamination and attempt to assess the horizontal and vertical extent of contamination. All locations will be drilled within the public right-of-way in an effort to minimize necessary access permitting and limit disruption to the community. The findings of these activities will guide the placement of monitoring wells.

Berger plans to conduct up to 60 groundwater screening sample locations (Figure 5). Initially, groundwater screening will be completed using a direct push drill rig equipped with a discrete groundwater sampling device such as the Geoprobe SP15/16® sampler, equipped with a 4 foot stainless steel screen. Groundwater samples will be collected with either a Teflon® lined bailer or via inertial pumping with Teflon® lined tubing with a foot or ball-check valve attached at one end.

Direct push groundwater screening locations will extend to a depth of 80 feet bgs or refusal. Groundwater samples will be collected from each location beginning at the water table, approximately 20 feet bgs, and continue to a depth of 80 feet or refusal at 10 foot intervals (example, 20-24, 30-34, 40-44, etc).

Continuous soil cores will be collected at most groundwater screening locations in an effort to characterize the soil. Soil cores will not be collected at the depths that the groundwater samples are being collected. All soils will be field-screened for organic vapors using a PID, and will be classified using the Burmister Soil Classification System. Excess soil cuttings or mud generated during the soil investigation that cannot be either returned to the borehole or spread on-site will be drummed and staged on-site, or at the approved staging location, for transport and disposal at a certified disposal facility. Screening locations shall require a permit and backgrouting.

If vertical delineation has not been achieved after the initial groundwater screening; contingent groundwater screening will be conducted at selected locations using mud rotary drilling and a

Hydropunch-II® discrete sampling device, with a one foot stainless steel screen. Groundwater samples will be collected within the barrel of the Hydropunch® sampler. Vertical sampling intervals shall be 1 foot and spaced every 10 feet (example 90-91, 100-101, 110-111, etc). Based on historic data and the anticipated depths of wells, it is proposed that groundwater screening be completed to a maximum depth of 150 ft bgs or the top of the clay confining layer (Lower Kirkwood).

Up to 420 groundwater screening samples may be collected and analyzed with an expedited turnaround time (TAT) for TCL VOC+10, including MTBE and TBA at a New Jersey Certified laboratory. The expedited TAT of 3 days has been selected in order to minimize the amount of remobilizations of Berger and drilling contractors to the Site. Potentially, an additional 420 groundwater screening samples may be collected and analyzed if all of the screening locations are advanced to 150 ft bgs.

Specific criteria for Class I-PL Protected aquifers do not exist. In past Berger investigations involving Class I-PL Protected aquifers, the criteria for the aquifers within the Pinelands default to the established practical quantitation limits (PQLs), which represent the "lowest concentration of a constituent that can be reliable achieved among laboratories within specified limits of precision and accuracy during routine laboratory operating conditions" (NJAC 7:9-6 - NJDEP, 1993).

4.7 MONITORING WELL INSTALLATION

Based on data collected through groundwater screening activities, permanent groundwater monitoring wells shall be installed. It is anticipated that a maximum of 30 monitoring wells (including single wells, pairs and triplets) will be installed both onsite and offsite to facilitate long-term monitoring. Location and construction of the wells will be based on groundwater screening results.

It is anticipated that groundwater screening may extend to a maximum depth of 150 ft bgs; therefore it is possible that deep monitoring wells may need to be completed to a similar depth in an effort to vertically delineate identified contamination.

All new wells will be installed using mud rotary drilling techniques with split-spoon samples collected at a 5-foot interval to facilitate lithologic logging of each monitoring well location. Wells will be constructed with 2-inch diameter, schedule 40, PVC casing threaded into a 10-foot length of 0.02 inch slotted PVC screen. The annular space between the PVC and the wall of each well boring will be filled with No. 2 size well sand to a depth corresponding to at least two feet above the well screen. A seal will be formed by using No. 00 size sand in the annular space

to immediately above the No. 2 well sand. The remaining annular space will be tremied with grout. Each well will be equipped with an expandable locking well plug and a protective steel housing (flush mount) over the PVC.

Following well installation, each new well will be hand-surged and developed with a submersible pump to remove as much sediment from the well as practical. Well development procedures will be performed until a near turbid-free discharge is achieved; or for a period of one hour, assuming that at least three well volumes are extracted from the well.

Excess soil cutting or mud generated during the soil investigation that cannot be either returned to the borehole or spread on-site will be drummed and staged on-site for disposal. All development water will be field screened with a PID and discharged to the ground surface unless determined to be grossly contaminated. If deemed to be contaminated, the purge water will be containerized and staged for disposal.

4.8 MONITORING WELL SAMPLING

Two monitoring well sampling events will be completed subsequent to monitoring well installations. The first sampling event will be completed approximately 14 days after the new monitoring well installations. The second event will be conducted approximately 30 to 60 days after the first sampling event. All newly installed wells will be purged and sampled using NJDEP low flow purging and sampling techniques presented in the FSPM.

Subsequent to the water level measurement at each well, Teflon®-lined tubing will be installed and connected to a submersible bladder pump. The placement of the pump intake will be determined based on the groundwater screening results. A low-flow purge will be initiated and maintained at a pumping rate not to exceed 500 ml/min. A continuous flow will be monitored for pH, dissolved oxygen, turbidity, conductivity, redox potential and temperature using a flow through cell. Additionally, water levels pump depth, purge rates/times, sampling times and weather will be recorded. After well purging and water stabilization requirements have been met, groundwater samples will be collected directly from the effluent (prior to flow through apparatus). The samples will be stored and shipped with ice preservation at less than 4^{o} Celsius temperature to the laboratory.

As detailed in Table 1, up to 30 groundwater samples for the each of the events, plus appropriate QA/QC samples will be analyzed for TCL VOC +10, MTBE, and TBA with a standard turnaround time (TAT) for each of the sampling events.

As mentioned above Specific criteria for Class I-PL Protected aquifers do not exist. the criteria for the aquifers within the Pinelands have in the past defaulted to the established practical quantitation limits (PQLs).

4.9 SURFACE WATER AND SEDIMENT INVESTIGATION

The wetland area northeast of the Site will be inspected for surface water. If surface water is present, five stream gauges will be installed and surveyed, and surface water and sediment samples will be collected at each location to address the possibility that the contaminated groundwater plume has reached the wetland area.

. Gauging and sample locations will be situated at the section of the wetlands that is closest to the Site down-gradient of the assumed longitudinal axis of the groundwater plume, plus upstream and downstream of the interpreted plume discharge area. Gauging locations will be established with the installation of a surveyed gauging staff which will facilitate measuring accurate surface water elevations. These elevations will be measured during each groundwater gauging event in an effort to determine the relationship between groundwater and surface water in the area. Surface water samples will be collected as grab samples and analyzed for TCL VOC+10, MTBE, and TBA. Surface sediment samples will be collected and analyzed for VOC+10, MTBE, TBA, total organic carbon (TOC) and grain size.

If surface water is not present though shallow soil within the wetland areas appears to be saturated, sediment pore water will be collected using passive diffusion bags (PDBs) buried within the wetland area. Following a certain amount of time, greater than two days and less than two weeks, the PDBs will be retrieved and the samples analyzed for TCL VOC+10, MTBE and TBA.

4.10 HYDROGEOLIGIC TESTING

In order to define aquifer characteristics associated with contaminant plume migration rates, hydraulic conductivity testing via slug testing will be conducted. The slug testing will be conducted on up to six of the monitoring wells. Rising head slug tests will be performed by removing a volume of water from deep monitoring wells. The rate at which the displaced water returns from formation will then be recorded for the duration of each test as described below.

Prior to implementing the slug test at each well, a static depth to water measurement will be recorded and a pressure transducer probe and submersible pump will be hung and stabilized in the well at appropriate depths. The pressure transducer will then be connected and configured to an automatic datalogger. Following a waiting period to allow the disturbed water level in the

well to equilibrate to natural conditions, the slug test will commence. A measured volume of standing water (slug) will be extracted from the well to produce a sufficient drawdown of the water level. As the displaced water recharges from the formation, the automatic datalogger will continuously record the rising water level until it reaches a level corresponding to a recovery of greater than 85% of the maximum drawdown. The slug test data will subsequently be graphed, tabulated and analyzed for the RIR using the Bouwer and Rice Method for calculating hydraulic conductivities (Bouwer and Rice, 1976).

4.11 RECEPTOR EVALUATION

In order to identify any potential ecological and human receptors that may be affected by the Site-related contamination, a well search and a qualitative baseline ecological evaluation will be conducted.

Well Search

A well search will be completed in accordance with NJAC 7:26E-4.4(h)3.v. A file search will be requested from the NJDEP Bureau of Water Allocation (BWA) for well records pertaining to monitoring and domestic wells within 1/2-mile of the down-gradient edge of the contaminant plume; and all industrial, irrigation, public supply wells, and wells with water allocation permits within 1-mile of the down-gradient edge of the contaminant plume. The results of the BWA well search will be cross-referenced with local records obtained from local health departments and water purveyors.

Baseline Ecological Evaluation

A baseline ecological evaluation will be conducted in accordance with N.J.A.C. 7:26E-3.11. This evaluation will be qualitative in nature, and will be based on sample results and site inspection by a person experienced in the use of techniques and methodologies for conducting ecological risk assessment. The study will identify: any contaminants that may exhibit the ability to biomagnify or bioaccumulate, any contaminants with concentrations that exceed the applicable standards, and any contaminant migration pathways or observed impacts to ecologically sensitive areas. As part of the evaluation, all surface waters, wetlands and environmentally sensitive locations in the study area will be inspected for sheens, seeps, stressed vegetation and any other evidence of contamination.

4.12 INVESTIGATIVE DERIVED WASTES

It is anticipated that during the course of the RI activities, investigative derived waste (IDW) will be generated and staged temporarily onsite or at an approved staging area. IDW will be segregated based on field observations, containerized in 55 gallon drums, and sampled for waste characterization by the Toxicity Characteristic Leaching Procedure (TCLP) and RCRA characteristics. IDW will be staged in a designated area onsite for future disposal at a certified disposal facility. The IDW generated will include drill cuttings (waste soils) and purge water from well sampling and development. It is anticipated that the majority of the IDW will be non-hazardous.

4.13 SITE SURVEY

A New Jersey licensed surveyor will be contracted to survey the monitoring wells and provide a base map for the Site. All horizontal data on the site map will be plotted in the New Jersey State Plane Coordinate System (NAD83), and spot elevations shown in the North American Geodetic Vertical Datum (NAGVD88). Mapping shall adhere to standards described in the NJDEP document Geographic Information System Digital Data Standards and include the requirements set forth in the New Jersey State Board of Professional Engineers and Land Surveyors Administrative Rules and Regulations. The topographic site map will include locations and elevations of all monitoring wells and sampling points. The data deliverable will include locations and elevations of all monitoring wells (PVC casing, stickup casing, and ground) and sampling points.

The elevation of the ground surface at each newly installed and existing monitoring well location and the top of PVC casing will be surveyed to the nearest 0.01 foot. A permanent survey mark will be etched into the top of the PVC casing to allow for accurate, consistent and comparable water level measurements over time. The horizontal location of the well will be surveyed to the nearest tenth of a second latitude and longitude. The surveyor will complete an NJDEP Monitoring Well Certification Form B for each well survey.

4.14 REMEDIAL INVESTIGATIVE REPORT

Following the implementation and completion of all activities included in this SSIP, an RI report will be drafted and submitted for review. The report will conform to the requirements for Site Investigation Reports and Remedial Investigation Reports as specified in NJAC 7:26E et seq. Typically, these reports include the following elements at a minimum:

- a description of all investigative activities performed;
- compilation and analysis of all derived investigative data;
- conclusions drawn from the data analysis;
- comparison of all data to NJDEP soil, groundwater, surface water, sediment, and ecological criteria, and
- recommendations for any further remedial investigations or remedial actions if warranted.

Data validation of the laboratory analyses will be performed by Berger and included as part of the Final reporting effort.

5.0 REFERENCES

5.0 REFERENCES

Berger, *Final Programmatic Health and Safety Plan.* Louis Berger & Associates, Inc., June 2005

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NJDEP, *NJDEP Field Sampling Procedures Manual,* August 2005.

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Stanford, Scott D., Surficial *Geologic Map of the Indian Mills and Medford Lakes Quadrangles, Burlington County, New Jersey*, New Jersey Geological Survey (NJGS) Geological Map Series GMS 93-1, 1981

United States Environmental Protection Agency, 1998. *Region II Low-Flow Groundwater Sampling Purging and Sampling Procedures.*

United States Department of the Interior, *Department of Fish and Wildlife, National Wetlands Inventory Map Series*

TABLES

Table 1

New Jersey Department of Environmental Protection

Joan's Cleaners

Tabernacle Township, New Jersey

Summary of Proposed Sampling and Analysis

Sample Type	Media	Quantity	Analytical Parameters	Method
Soil Investigation	Soil	50	TCL VOC+10, TOC	EPA 624/SW846 8260/9060M
Groundwater Screening (60 screening locations, 7 depths)	Groundwater	420	TCL VOC + 10, MTBE, and TBA	EPA 624/SW846 8260
ContingentGroundwater Screening (60 screening locations, 7 depths)	Groundwater	420	TCL VOC + 10, MTBE, and TBA	EPA 624/SW846 8260
Monitoring Wells (30 wells, 2 events)	Groundwater	60	TCL VOC + 10, MTBE, and TBA	EPA 624/SW846 8260
Surface Water	Water	5	TCL VOC + 10, MTBE, and TBA	EPA 624/SW846 8260
Pore Space Water (PDB)	Water	5	TCL VOC + 10, MTBE, and TBA	EPA 624/SW846 8260
Sediment	Sediment	5	TCL VOC + 10, MTBE, TBA, total organic carbon, grain size and pH	EPA 624/SW846 8260, AQ-EPA 415.1/SW846 9060M, ASTM D422, EPA150.1/SW846 9040/9045
Septic Liquid	Aqueous	1	TCL VOC + 10, MTBE, and TBA	EPA 624/SW846 8260
Septic Sludge	Sludge	1	TCL VOC + 10, MTBE, and TBA	EPA 624/SW846 8260
QA/QC Trip Blanks (One per cooler)	Water	75	TCL VOC + 10, MTBE, and TBA	EPA 624/SW846 8260
QA/QC Field Blanks (one per day)	Water	100	TCL VOC + 10, MTBE, and TBA	EPA 624/SW846 8260
QA/QC Duplicate Samples (one per 20 samples)	Soil	3	TCL VOC+10	EPA 624/SW846 8260
QA/QC Duplicate Samples (one per 20 samples)	Groundwater	24	TCL VOC + 10, MTBE, and TBA	EPA 624/SW846 8260
Contingent QA/QC Duplicate Samples (one per 20 samples)	Groundwater	21	TCL VOC + 10, MTBE, and TBA	EPA 624/SW846 8260
QA/QC Duplicate Samples (one per 20 samples)	Sediment	1	TCL VOC + 10, MTBE, and TBA	EPA 624/SW846 8260
IDW	Soil/Sludge	5	TCLP VOCs, RCRA Charteristics (Ignitability, Corrisivity, Reactivity)	SW846 8260, SW846 Chapter 7

Notes:

TCL VOC+10 = Target Compound List Volatile Organic Compounds - search for 10 non-targeted tentatively identified compounds

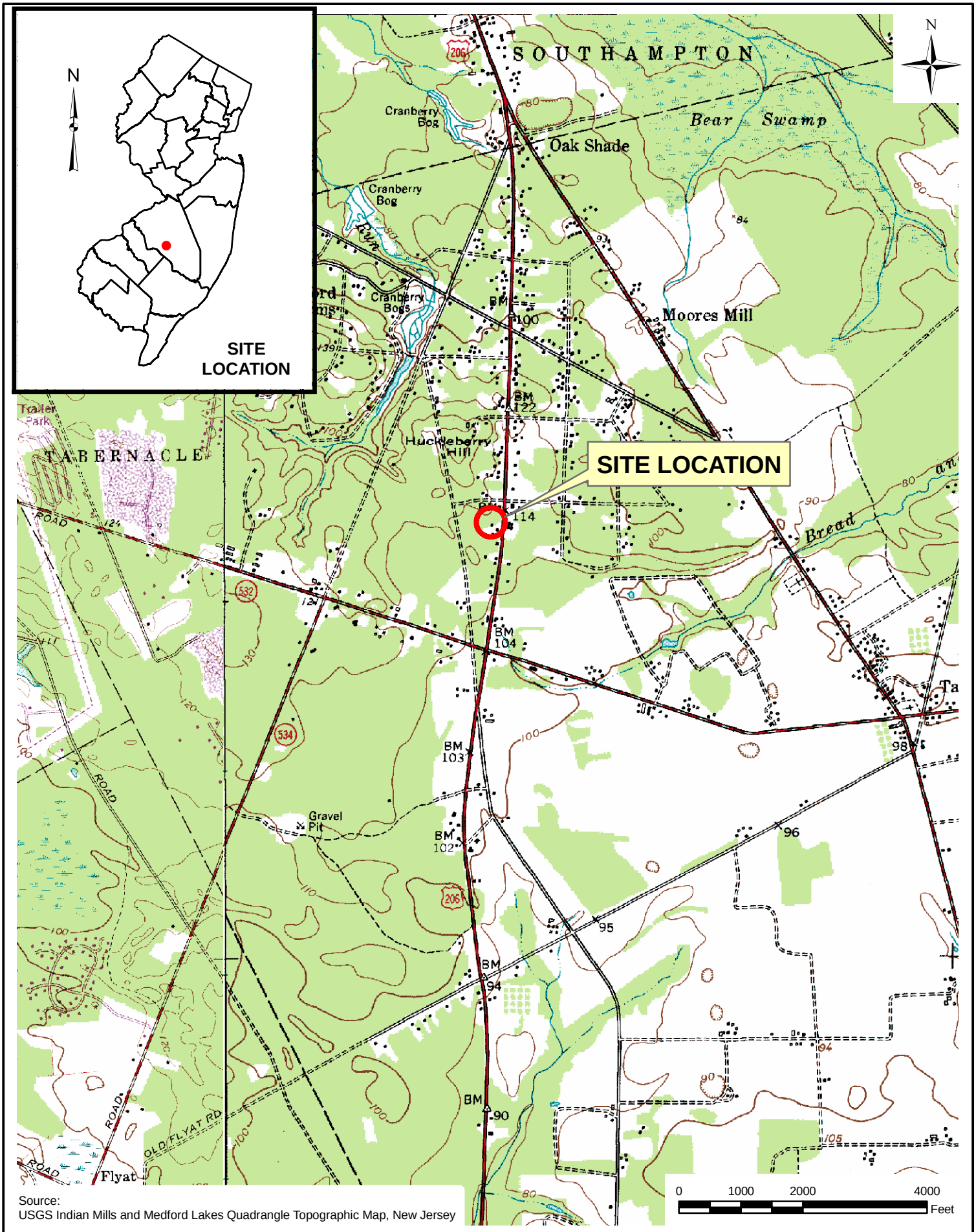
TOC = Total Organic Carbon

PDB = Passive Diffusion Bag

IDW = Investigation Derived Wastes

TCLP = Toxicity Characteristic Leaching Procedure

FIGURES



Source:
USGS Indian Mills and Medford Lakes Quadrangle Topographic Map, New Jersey

N.J. Department of Environmental Protection

JOAN'S CLEANERS, TABERNACLE, NEW JERSEY

SITE LOCATION MAP

NJDEP CONTRACT No. A-73073

The Louis Berger Group, Inc.
412 MT KEMBLE AVE
MORRISTOWN, NJ

FIGURE 1

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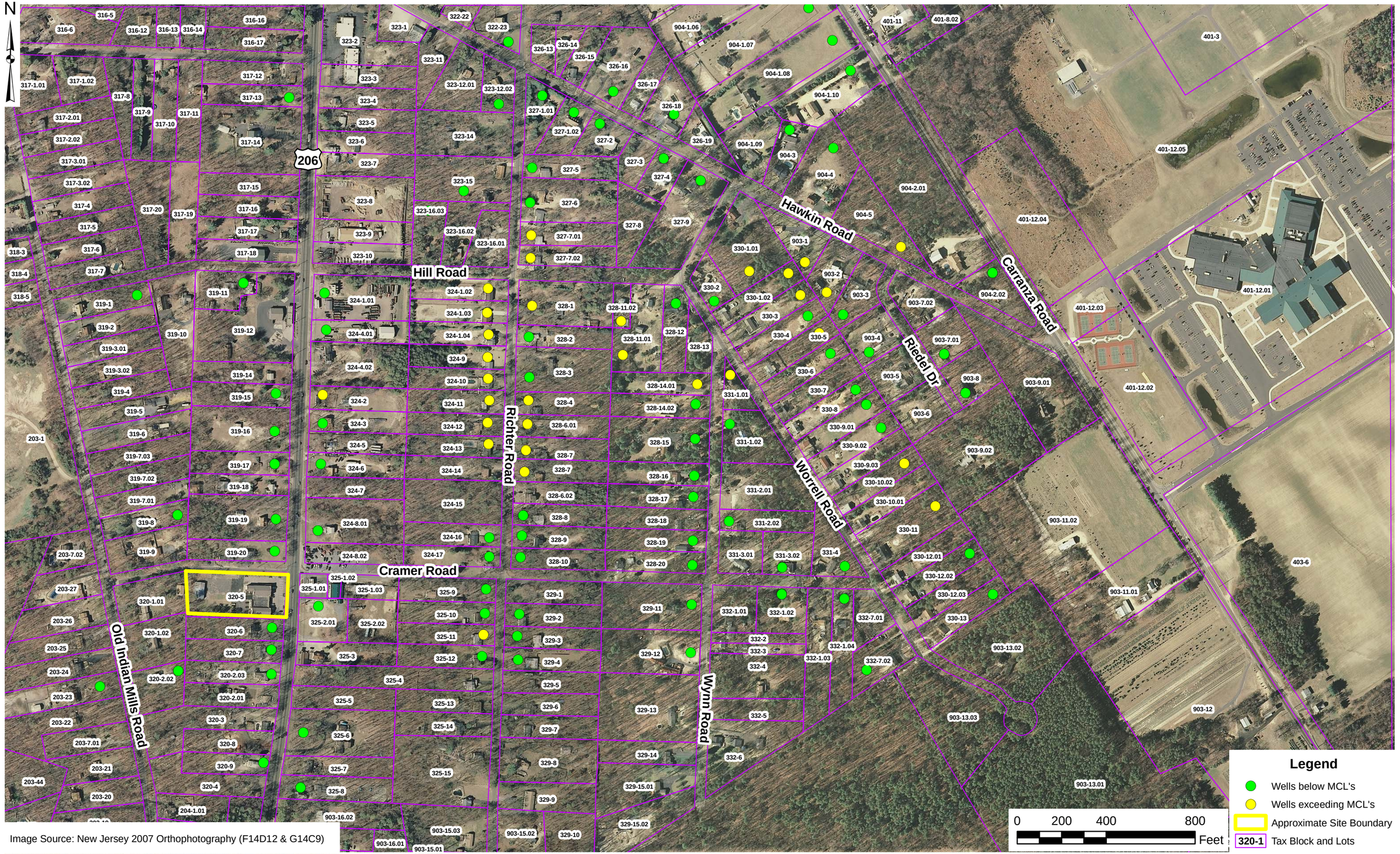

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N.J. Department of Environmental Protection

JOAN'S CLEANERS, TABERNACLE TOWNSHIP, NEW JERSEY

SITE PLAN

NJDEP CONTRACT No.A-73073

The Louis Berger Group, Inc.
412 MT KEMBLE AVE
MORRISTOWN, NJ

FIGURE 2

N

Legend

- Wells below MCL's
- Wells exceeding MCL's
- Deciduous Wooded Wetlands
- Approximate Site Boundary

DECIDUOUS WOODED WETLANDS

206

Hill Road

Hawkin Road

Carranza Road

Riedel Dr

Richter Road

Worrell Road

Cramer Road

Old Indian Mills Road

Wynn Road

Image Source: New Jersey 2007 Orthophotography (F14D12 & G14C9)

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N.J. Department of Environmental Protection

JOAN'S CLEANERS, TABERNACLE TOWNSHIP, NEW JERSEY

WETLANDS MAP

NJDEP CONTRACT No.A-73073

The Louis Berger Group, Inc.
412 MT KEMBLE AVE
MORRISTOWN, NJ

FIGURE 3

Image Source: New Jersey 2007 Orthophotography (F14D12)

N.J. Department of Environmental Protection	JOAN'S CLEANERS, TABERNACLE, NEW JERSEY **SOIL SAMPLE LOCATION PLAN** NJDEP CONTRACT No. A-73073	**The Louis Berger Group, Inc.** 412 MT KEMBLE AVE MORRISTOWN, NJ	**FIGURE 4**

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GW-146
GW-147
GW-148
GW-149
GW-150
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GW-101
GW-102
GW-103
GW-104

Hawkin Road
206
Hill Road
Cramer Road
Old Indian Mills Road
Richter Road
Wynn Road
Worrell Road
Riedel Dr
Carranza Road

Image Source: New Jersey 2007 Orthophotography (F14D12 & G14C9)

0 200 400 800
Feet

Legend

- Proposed Groundwater Sample Location
- Wells below MCL's
- Wells exceeding MCL's
- Street
- Approximate Site Boundary

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N.J. Department of Environmental Protection

JOAN'S CLEANERS, TABERNACLE TOWNSHIP, NEW JERSEY

GROUNDWATER SCREENING LOCATION PLAN

NJDEP CONTRACT No.A-73073

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MORRISTOWN, NJ

FIGURE 5

Submitted by:

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May 2009