THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering

JUN 0 2 1995

June 1, 1995

Mr. Michael Smith
Hazardous Materials Management Division
Department of Environmental Conservation
103 South Main Street / West Building
Waterbury, Vermont 05671-0404

Re: Palmer Brothers/Caledonian Record. Report on Phase II/III Investigations.
JCO No. 1-1845-1.

Dear Michael:

Enclosed please find our report describing the procedures and findings of our investigation at Palmer Brothers/Caledonian Record site in St. Johnsbury, Vermont. Since it has been some time since any documents have been delivered to the Hazardous Materials Management Division, I will briefly refresh your memory on what this report describes.

The Phase II investigation consisted of a soil gas survey in the immediate vicinity of Caledonian Record's monitoring well MW-1, and into the alley next to Palmer's building. Phase III activities involved the installation of three soil cores across the street (east) from MW-1 on land owned by Caledonian Record. No analytical samples were collected during any phase.

Should you have any questions or comments, please contact me at 229-4600.

Sincerely,

THE JOHNSON COMPANY, INC.

By: Jim Bowes
Senior Scientist
James R. Bowes

enclosure

cc: Charles Palmer, Palmer Brothers - (w/o enclosure)
Daniel Goss, Royal Insurance Company - (w/o enclosure)

Reviewed by: sep
I:\PROJECTS\1-1845-1\COVRLTR.TWO May 31, 1995 16:06 jrb

Palmer Brothers

Caledonian Record

Phase II and Phase III Investigation Report

May 1995

Prepared for:

ROYAL INSURANCE
Environmental Claim Unit
9140 Arrowpoint Blvd., Suite 440
Charlotte, NC 28273

Prepared by:

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EXECUTIVE SUMMARY

The Palmer Brothers/Caledonian Record site is located near the intersection of Eastern Avenue and Federal Street in downtown St. Johnsbury. The site is delineated by the Palmer Brothers building to the north, the Caledonian Record warehouse/shop to the south, Federal Street on the east, and a steep slope to the west. This report describes Phase II and Phase III investigations performed by The Johnson Company, Montpelier Vermont as outlined in the approved work plan filed with the State of Vermont Hazardous Materials Management Division (HMMD). The Phase II investigation consisted of a soil gas survey that originated in the immediate vicinity of Caledonian Record's groundwater monitoring well MW-1, and continued north onto Palmer Brothers property into the alley that abuts the east side of the Palmer building. A total of 20 locations were tested.

Results indicate the presence of soil gas contaminant concentrations ranging from 0.0 to 5.2 parts per million as registered on an Organic Vapor Meter (OVM) in 19 of 20 locations tested. A sustained reading of 140 parts per million was registered by the OVM at a location (Location #3) near Palmers Building, in the alley. Low and sporadic soil gas readings were indicated at locations tested between MW-1 on Caledonian Record property, and soil gas location #3 (approximately 60 feet apart), so it is not possible to ascertain if a correlation between these two locations exists. Readings in the immediate vicinity of MW-1 did not exceed 4 ppm. Phase III work consisted of examining three soil cores on property east of Federal St., owned by Caledonian Record with the objective of ascertaining the soil stratigraphy, and approximate depth to groundwater in this vicinity. The three soil cores (SC-1; SC-2 and SC-3) were collected using drive point technology (DPT) consisting of an air powered drive hammer and winch assembly mounted on scaffolding. The stratigraphic assemblage is typical of that described in literature as glacio-lacustrine origin, consisting of an assemblage of sands, silty sands and clays. Groundwater was indicated in all three locations, at depths varying from 8.3 to 14.6 feet below ground surface. Field screening for presence of volatile organic compounds in the soil cores was done with the OVM. Of the locations, the only one with measurable readings was at SC-2 when sustained readings of 20 ppm above background were registered in the lowermost foot of a core sample retrieved from approximately 5 to 10 feet. The elevated readings on the OVM were associated with petroleum-like odors. Based upon the results of the Phase II and Phase III investigations, The Johnson Company recommends the installation of a set of piezometer nests for groundwater sampling at the "SC" locations, with a shallow and deep piezometer installed at each location. For characterizing hydraulic conductivity (K), slug tests should be performed in the piezometer nests. This information, along with depth to water level measurements would then be utilized to determine the best locations for groundwater monitoring wells.

1.0 INTRODUCTION

This document has been prepared by The Johnson Company, Inc. (Montpelier, Vermont) on behalf of Palmer Brothers Inc., St. Johnsbury, Vermont. Palmer Brothers operates a dry cleaning business located on Eastern Avenue in St. Johnsbury at Latitude 44° 25'; Longitude 72° 2' (Attachment 1, Attachment 2). This Phase II/Phase III report is being submitted pursuant to the work plan generated by The Johnson Co. and presented to the State of Vermont Hazardous Materials Management Division (HMMD). The HMMD approved the original work plan October 6, 1994, and a revised work plan on December 9. The revised work plan addressed the installation of a line of soil cores located east of, and across Federal Street from MW-1, on property also owned by Caledonian Record (see Attachment 2). The cores were located across the street to minimize the potential for cross contamination in the immediate vicinity of MW-1 (Attachment 2).

In October, The Johnson Company (JCO) began Phase I of this investigation, consisting of water quality sampling of Caledonian Record's monitoring well (MW-1), and receptor survey, and source assessment. Results of Phase I were summarized in a report titled "Palmer Brothers/Caledonian Record Phase I Investigation Report" dated December 1994. This report is on file at the HMMD offices. Groundwater sampling performed during Phase I indicated tetrachloroethene (PCE) in groundwater sampled from MW-1 at 1,220 µg/L, well above the State Enforcement Standard of 0.07 µg/L. However, compared to an earlier sample collected in April 1994 (when PCE was indicated at 4,980 µg/L) the October 1994 result was significantly less (The Johnson Company, 1994). The receptor survey did not indicate the presence of sensitive receptors to the contamination in MW-1 (The Johnson Company, 1994)). The source assessment performed during Phase I identified a potential source of the indicated contamination in MW-1, specifically the removal of Palmers old dry cleaning machine in August 1993. However, the historical usage of PCE at Palmers also provided a potential source of the indicated contamination (The Johnson Company, 1994).

The recommendations in the Phase I report were to implement the Phase II soil gas survey and Phase III soil core sampling plans. This report consists of the description of the methods used, and the results of the following work plan components of the Palmer Bros/Caledonian Record investigation:

- Phase II: Performance of soil gas survey on both Caledonian Record and Palmer Brothers properties on December 23, 1994;
- Phase III: Installation of three (3) soil cores and subsequent soil and groundwater mapping on Caledonian Record property abutting Federal Street on December 28-29, 1994.

2.0 PHASE II SOIL GAS SURVEY

The soil gas survey was performed on December 23, 1994. A total of 15 locations were tested in the vicinity of MW-1 on Caledonian Record's property, as well as on Palmer Brothers property. These locations are shown in the attached site map (Attachment 3).

2.1 PHASE II METHODS

The soil gas probes were constructed of three-foot sections of 0.75 inch Schedule 80 black steel pipe with NPT male threads on each end, with a conical steel tip threaded to the bottom end. The lowermost section of pipe was perforated with 1/8 inch diameter holes spaced evenly and frequently across a two foot interval. Each probe assembly was decontaminated prior to use by washing in a hot water/Alconox® soap solution, followed by a hot water pressure wash and steam cleaning inside and out. The probes were packaged in clean cardboard tubing to minimize the likelihood of cross contamination during transport to the job site.

The probes were installed December 23, 1994 using a portable Hitachi electric jackhammer fitted with an adapter into which the top end of each probe was threaded. This allowed the operator to force the probe into the ground until the conical tip reached a depth of 32 inches below ground surface. The jackhammer was powered by a portable gasoline powered generator which was set up approximately 50 feet downwind of the nearest sample location.

Upon installation, the jackhammer and adapter were removed and a four foot section of clear, 5/8 inch outside diameter (OD) vinyl tubing was cut from its original roll, and inserted into the soil probe to the maximum depth of the probe. The protruding portion of the probe and vinyl tubing were sealed with a temporary barrier consisting of duct tape to keep outside air from entering the probe.

The testing was initiated following installation of all 15 soil probes. The tubing was temporarily sealed, and the tip of a Thermo Environmental 580B Organic Vapor Meter (OVM) was connected and likewise sealed to the tubing. At the onset of testing, a background reading was collected from a representative section of tubing. The tubing sample registered 0.2 to 0.6 parts per million on the OVM.

The soil gas readings were collected the same day as installation. The readings were collected by running the OVM and noting the readings during a timed interval of two minutes for each sample location. During this interval, the initial, peak, and sustained readings were recorded.

2.2 PHASE II RESULTS

A summary of the soil gas readings are listed in Table 1.

TABLE 1
SOIL GAS SURVEY RESULTS
PALMER BROS/CALEDONIAN RECORD SITE
DECEMBER 23, 1994

Sample Location	Initial Reading	Peak Reading	Sustained Reading
1	0.0	1.4	1.0
2	0.0	1.9	1.4
3	20.0	140.5	140.5
4	0.0	1.9	1.3
5	0.0	6.1	5.2
6	0.0	2.3	0.6
7	0.0	2.3	1.9
8	0.0	4.4	4.0
9	0.0	3.5	1.4
10	0.0	4.4	2.7
11	0.0	2.3	1.9
12	0.0	1.4	1.0
13	0.0	1.0	0.9
14	0.0	0.2	0.0
15	0.0	1.0	0.8

Of the locations tested, the highest reading was recorded on Palmer Brothers property with volatile organic compound (VOC) vapor concentrations registering a sustained reading of 140 parts per million (ppm) in soil at a location directly outside (east) of Palmers building (Sample location 3, Attachment 3). Soil gas readings located near the vicinity of MW-1 were detected, but at lower concentrations (1 to 3 ppm).

A direct correlation between the elevated soil reading in Palmers alley and MW-1 does not appear to exist, as indicated by the sporadic readings from locations tested between the alley and MW-1 (Attachment 3).

The objective of the Phase II soil gas survey was to delineate areas of elevated VOC vapors in the soil. The results of the soil gas survey indicated the highest VOC vapors in soil were located in the alley at the Palmer Brothers building. Due to the much lower, sporadic readings measured between MW-1, and the alley, it is not clear if a correlation exits between the two locations (the alley and MW-1).

3.0 PHASE III SOIL CORE SAMPLING

3.1 PHASE III METHODS

Soil core samples were collected on December 28 and 29, 1994. The objective of the soil core program was to delineate the stratigraphy and also to determine the presence of groundwater across the Caledonian Record's MW-1 location. This approach was due to information from a previous investigation by The Johnson Company in September 1993, when three soil borings were installed, and groundwater was not encountered at any location (The Johnson Company, 1993).

The soil cores were driven using a drive point piston coring tool (Starr and Ingleton, 1992) whereby a 5 foot long by 2 inch diameter aluminum sample tube is driven into the soil by a 250 pound air hammer. The sample core is retrieved by a winch mounted on scaffolding.

The work plan originally approved by the HMMD described that the soil cores would be driven in the immediate vicinity of where the soil gas survey was performed. This approach was modified due to the concerns that driving soil cores through potentially highly contaminated soils in the immediate vicinity of Palmers might risk cross contamination of lesser, non-contaminated soil and/or groundwater by mobilizing any DNAPL that might be present. As such, JCO recommended that an initial set of soil cores be collected across the street from Palmers (Attachment 3) on property owned by Caledonian Record.

The soil cores were located east of Federal Street (Attachment 4), and designated SC-1, SC-2, and SC-3. For each location, core samples were collected, field screened with a photoionization detector (PID) for presence of VOC vapors, and logged for stratigraphy.

3.2 PHASE III RESULTS

3.2.1 Stratigraphy

The stratigraphy as characterized by this investigation consists predominantly of sandy silts and clay, with isolated layers of coarse sand, some of which were water-saturated at depth. Detailed well logs are provided for each of the locations tested, and are included in Attachment 5.

The unconsolidated material encountered during this investigation consists of sandy to silty gravelly till, and in two of the locations, the bottom intervals were characterized by clay. At one location (SC-2, Attachment 5) a clay layer was encountered from five to nine feet below grade. Stewart and MacLintock (1969) describe an assemblage comprised of clays, sands, and pebbly sands of various texture related to glacial Lake Hitchcock as typical of unconsolidated deposits in the St. Johnsbury area. The soils logged from the "SC" locations appear typical of those described in Stewart and McLintock (1969). Indeed, the elevation of the Palmer Brothers/Caledonian Record site (760 feet) falls below the documented Lake Hitchcock level for this area.

During the soil logging, field screening with a 580B Organic Vapor Meter photoionization detector (PID) was performed. No readings above background were recorded in soil samples from locations SC-1, and SC-3. In SC-2, a clay layer was encountered approximately 5 feet below the ground surface, and extended to 9 feet. Below this layer an interval of sand exhibiting a strong odor of motor fuel was encountered in the lowermost foot of this borehole. The fuel odor interval was associated with sustained readings of 20 ppm on the PID. As the access agreement with Caledonian Record did not allow for collection of samples for laboratory analysis, a sample for laboratory analyses could not be collected. Typically, soils contaminated with PCE are associated with a distinctly sweet smelling solvent odor. The strong fuel smell associated with this sand interval suggests contamination related to petroleum products, however, analytical data are not presently available to confirm this.

The stratigraphy as determined from the Phase III investigation indicates an irregular pattern with respect to the clay layer encountered in SC-2. This unit was encountered from 5 to 9 feet at SC-2, whereas in SC-1 it was not encountered until near bottom of the boring (total depth: 14.8 feet). Similarly at SC-3 a clay unit was not encountered until approximately 14.5 feet. This suggests either of two likely scenarios: 1) the unconsolidated stratigraphy is characterized by a morphology that is "draped" over an undulating bedrock surface which is higher below SC-2 than the other locations; or, 2) the unconsolidated stratigraphy is characterized by highly irregular and discontinuous clay lenses, with an "upper clay layer" being intersected at SC-2. Since the clay layer was not encountered at a projected intercept depth in either SC-1 or SC-3, either it thins out, or has been eroded beneath SC-1, and SC-3.

Planned additional activities proposed for this site include installing a pair of piezometers at each of the "SC" locations. As part of this additional phase, we would drive soil cores to depths below those tested during the December 1994 Phase III investigation either to refusal, or 15 feet into clay, whichever is encountered first. Additional deep soil cores should help discern the nature of the unconsolidated deposits.

3.2.3 *Groundwater*

In addition to the soil stratigraphy, the Phase III investigation was used to ascertain if groundwater was present in the unconsolidated deposits, which could facilitate a groundwater sampling program. Groundwater was encountered in each of the three locations on this date (December 29, 1994) the measurements of which have been summarized in Table 2.

TABLE 2
GROUNDWATER MEASUREMENT SUMMARY
PALMER BROTHERS/CALEDONIAN RECORD SITE
ST. JOHNSBURY, VERMONT
DECEMBER 29, 1994

Location	Depth to Water Below Ground (feet)	Relative Ground Surface Elevation	Groundwater Elevation
SC-1	8.5	101.15	92.65
SC-2	8.3	99.11	90.86
SC-3	14.6[1]	92.69	78.09
MW-1	3.32[1]	100.00[2]	96.68
SB-1	DRY	109.78[2]	DRY

[1] Depth below Top of Casing
[2] Relative Top of Casing elevation

A depth to water measurement was made in a previously installed monitoring well (SB-1, Attachment 4) to test for presence of groundwater at this location. This well was dry as measured on December 29, 1994.

The relative elevation of the ground surface at each "SC" location (and top of casing elevation at SB-1) were surveyed December 29, 1994 using an autolevel and rod and referenced to an assumed bench mark elevation of 100 feet established at the top of the well casing at MW-1 . Hydraulic head was calculated for each location measured by subtracting the depth to water reading from the relative elevation. A preliminary groundwater contour map was generated from these measurements on this date and is included as Attachment 5.

The approximate direction of groundwater flow as determined by the hydraulic head data is toward the east from MW-1 to Caledonian Record's office building (Attachment 5). A hydraulic gradient of 0.17 foot/foot was indicated from this map.

No statement as to the groundwater quality beyond that tested at MW-1 can be determined since samples were not collected at the "SC" locations. However, with the exception of location SC-2, VOC vapors within the soil boring headspace area were not recorded over 2 to 3 ppm above background. The headspace area of MW-1 has been measured with a PID at approximately 30 to 50 ppm above background.

4.0 SUMMARY and RECOMMENDATION

The objective of the Phase II soil gas survey was to delineate zones of elevated VOC vapors in soil in and around the vicinity of MW-1. The objective of the Phase III investigation was to evaluate the soil units and determine if groundwater were present that would facilitate a groundwater sampling program. It was determined from the "SC" locations that groundwater occurs between 8 and 15 feet below the ground, and that groundwater samples could be collected for laboratory analyses through implementation of drive point piezometers and/or monitoring wells.

The stratigraphy as delineated by the soil cores installed across the street from the Palmer property is to date not completely delineated, but appears to be characterized by glacio-lacustrine deposits ranging from coarse sand lenses to clay.

The Johnson Company recommends that water quality samples be collected from temporary shallow and deep piezometers at the same locations tested in December 1994 (SC-1; SC-2 and SC-3). Since the "SC" series of soil core samples were performed with the understanding that no analytical work would be allowed, arrangements with the Caledonian Record will need to be finalized prior to implementing this next step. In the event access to obtain analytical samples from the Caledonian Record's property in not allowed, we would pursue sampling from the same general locations, but on the west side of Federal Street.

Slug tests should be performed within the drive-point piezometers. Information from the slug tests will be used to calculate the hydraulic conductivity (K) that, in conjunction with groundwater level measurements will be used to characterize the groundwater flow velocities.

Upon ascertaining the best locations for groundwater monitoring, (based upon the estimated groundwater migration rate, and water quality data from the drive point piezometers), The Johnson Company would recommend a program of quarterly monitoring for a period of at least one year to track the trend of PCE in MW-1 and downgradient.

5.0 REFERENCES

Stewart, D.P. and MacClintock,P., 1969, The Surficial Geology and Pleistocene History of Vermont, Vermont Dept. of Water Resources Bulletin No. 31.

The Johnson Company, Inc., 1993, "Summary Remedial Investigation Report for Palmer's Dry Cleaners, Inc.", October 1993.

The Johnson Company, Inc., 1994, "Palmer Brothers/Caledonian Record Phase I Investigation Report", December 1994.

Attachment 1

Location Map

BASE MAP : USGS 1:25,000 Metric Topographic Map: St. Johnsonbury, VT (Provisional Edition 1983).

FIGURE 1 : Site Location Map
Palmer Brothers, Inc.
St. Johnsbury, Vermont

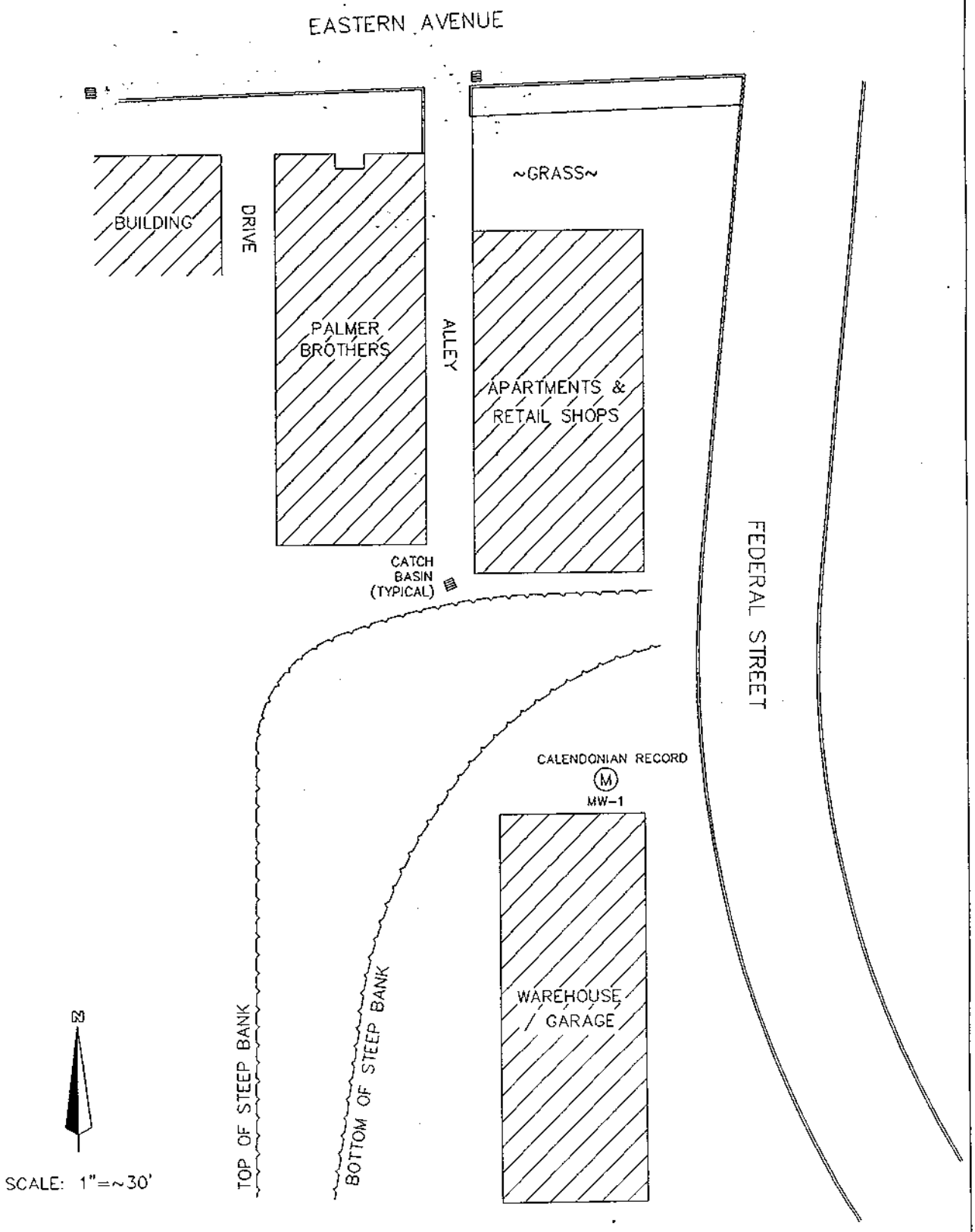
THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering
100 STATE STREET MONTPELIER, VT 05602

Attachment 2

Site Sketch Map

1-1845-1\SITE.dwg

NOTE: ALL LOCATIONS AND DISTANCES ARE APPROXIMATE.



SITE SKETCH
PALMERS DRY CLEANERS
ST. JOHNSBURY, VERMONT

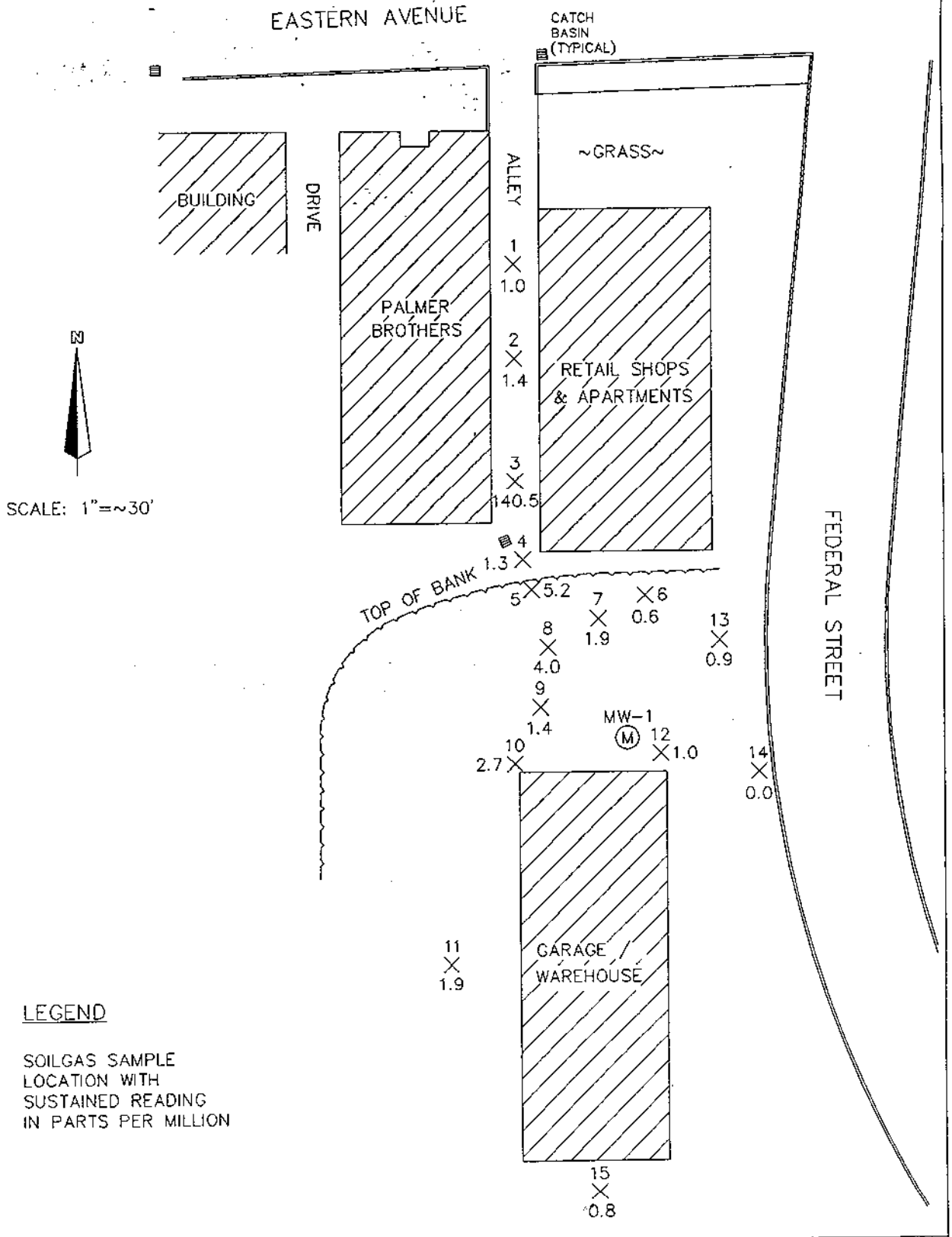
THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering
100 STATE STREET MONTPELIER, VT 05602

Attachment 3

Soil Gas Sample Locations

1-1845-1\VAPOR.dwg

NOTE: ALL LOCATIONS AND DISTANCES ARE APPROXIMATE.



LEGEND

11 / 1.9 — SOILGAS SAMPLE LOCATION WITH SUSTAINED READING IN PARTS PER MILLION

SOIL VAPOR SURVEY
PALMERS DRY CLEANERS
ST. JOHNSBURY, VERMONT

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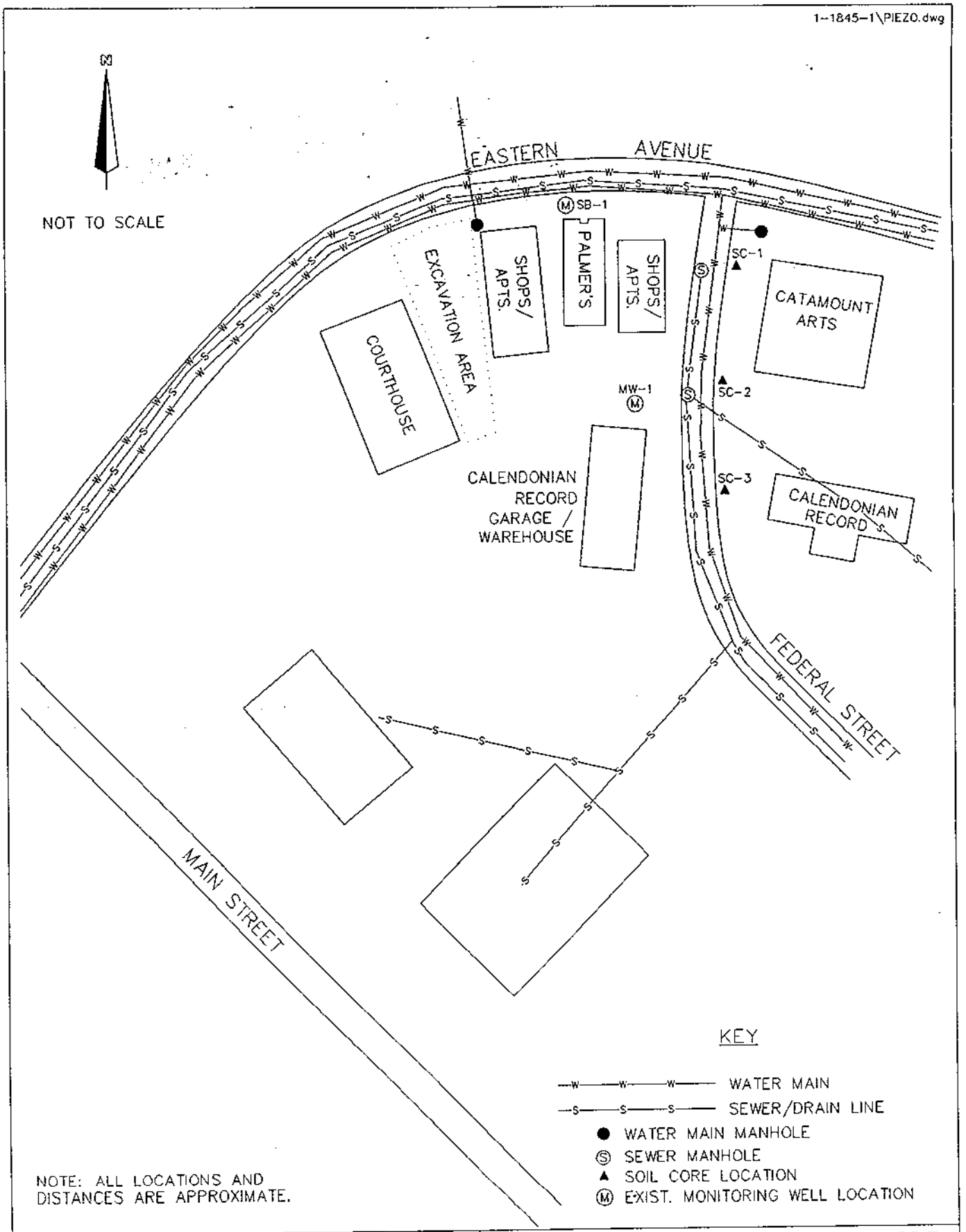
Environmental Sciences and Engineering
100 STATE STREET MONTPELIER, VT 05602

Attachment 4

Soil Core Locations



PALMERS DRY CLEANERS
AND CALENDONIAN RECORD
ST. JOHNSBURY, VERMONT

THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering
100 STATE STREET MONTPELIER, VT 05602

Attachment 5

Soil Core Logs

The Johnson Company, Inc.
Environmental Sciences and Engineering
100 State Street
Montpelier, Vermont 05602

DRILLING LOG
WELL # SC-1

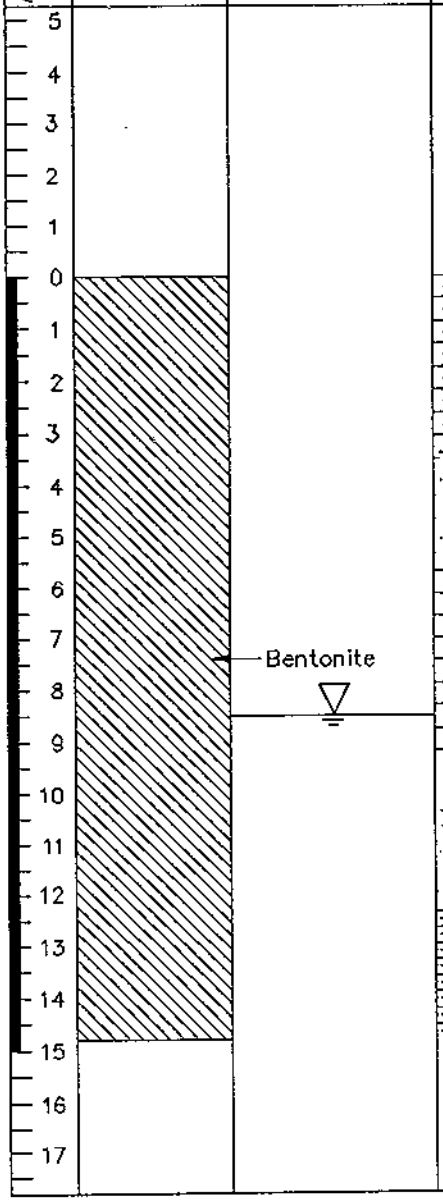
Project: Palmers/Calendonian Record
Location: St. Johnsbury, Vermont
Job # 1-1649-4
Logged By: JRB
Date Drilled: 12/28/94
Driller: JCO-DPT
Drill Method: DPT

Casing Type: N/A
Casing Diameter:
Casing Length:
Screen Type: N/A
Screen Diameter:
Screen Length:
Slot Size: N/A

Total Pipe: 0.0 ft.
Stick Up: 0.0 ft.
Total Hole Depth: 14.8 ft.
Well Guard Length: 0.0 ft.
Initial Water Level: 8.5 ft.
Surface Elevation: 101.15
T.O.C. Elevation: N/A

▮ = Sampled Interval

Sheet 1 of 1



PID Reading	Description
0.00	0 to 5 Ft: 60 % sample recovery; Medium-coarse sand (fill?); consisting of fractured shale in lowermost 0.3 ft; loamy olive brown silt layer at 3.3 to 3.6 feet; PID readings not above background thru-out interval.
0.6 to 1.0	5 to 10 Ft: 33 % sample recovery; dark brown/gray sand w. silt; wet & mottled at 9.5 feet; dark brown/red compacted loamy sand at bottom (drier); PID readings ranged from 0.0 in upper 4 feet--0.6 to 1.0 in lowermost sample int'vl.
0.6 to 1.0 not meas.	9 to 14.75 Ft: 97 % recovery; Upper most interval is spoil; silt lens at 10.3-10.4'; saturated brown gravelly sand from 10.4-11.1; silty clay interbedded w. med sands with increasing plasticity with depth; strong mottling and sat'd at 13.5'.
	Note for 10 to 15 Ft: no recovery--pulled soil tube, noted it was bent about 10 degrees; re-entered hole w. piston corer, redrove--still no recovery.

The Johnson Company, Inc.
Environmental Sciences and Engineering
100 State Street
Montpelier, Vermont 05602

DRILLING LOG
WELL # SC-2

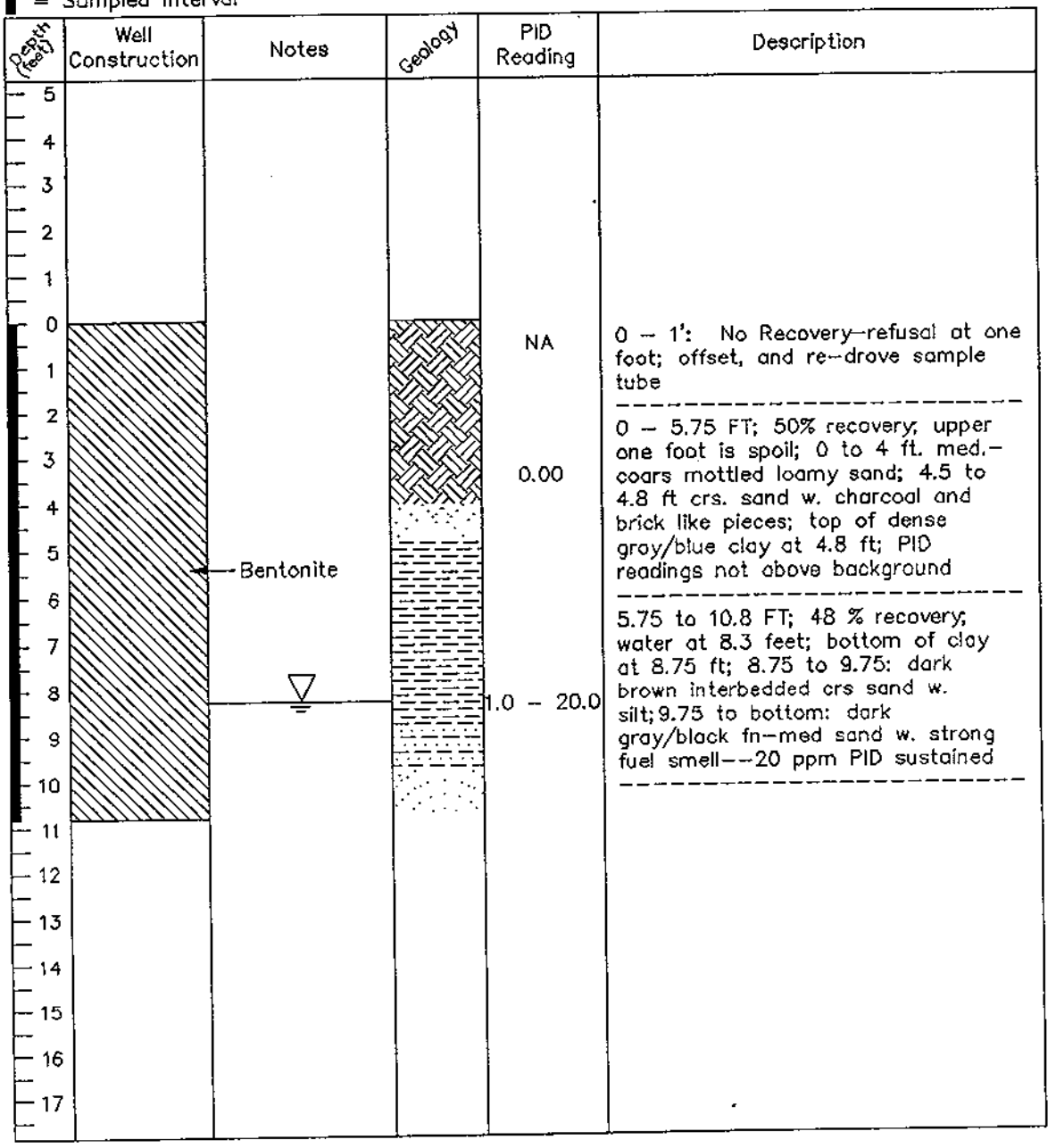
Project: Palmers/Calendonian Record
Location: St. Johnsbury, Vermont
Job # 1-1649-4
Logged By: JRB
Date Drilled: 12/27/94
Driller: JCO
Drill Method: DPT

Casing Type: NA
Casing Diameter:
Casing Length:
Screen Type: Factory
Screen Diameter:
Screen Length:
Slot Size: 010

Total Pipe: 0.0 ft.
Stick Up: 0.0 ft.
Total Hole Depth: 10.7 ft.
Well Guard Length: 0.0 ft.
Initial Water Level: 8.3 ft.
Surface Elevation: 99.11
T.O.C. Elevation: --

▮ = Sampled Interval

Sheet 1 of 1



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100 State Street
Montpelier, Vermont 05602

DRILLING LOG
WELL # SC-3

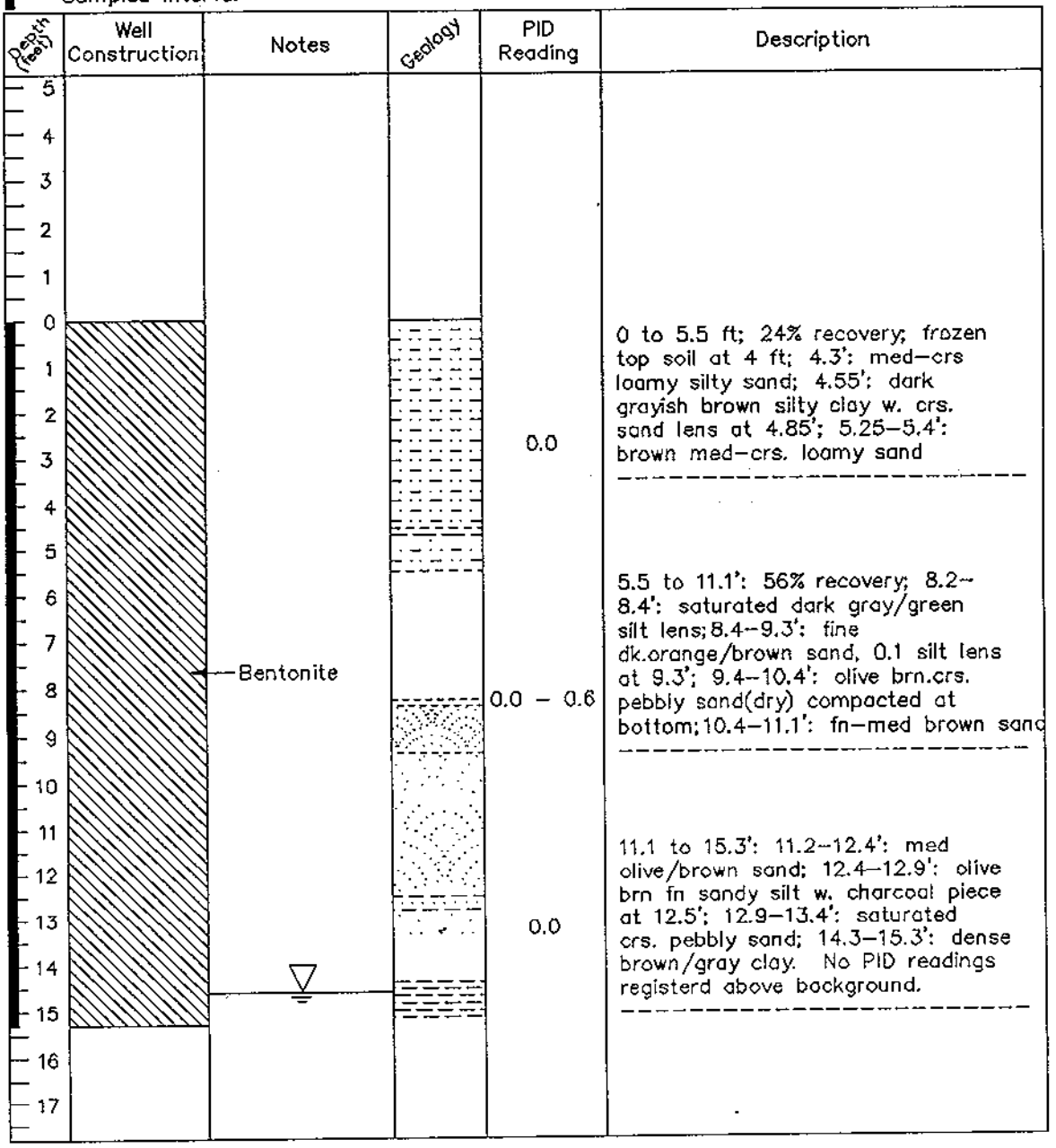
Project: Palmers/Calendonian Record
Location: St. Johnsbury, Vermont
Job # 1-1649-4
Logged By: JRB
Date Drilled: 12/29/94
Driller: JCO/PTD
Drill Method: DPT

Casing Type: NA
Casing Diameter:
Casing Length:
Screen Type: Factory
Screen Diameter:
Screen Length:
Slot Size: 010

Total Pipe: 0.0 ft.
Stick Up: 0.0 ft.
Total Hole Depth: 15.3 ft.
Well Guard Length: 0.0 ft.
Initial Water Level: 14.6 ft.
Surface Elevation: 92.65
T.O.C. Elevation: --

▌ = Sampled Interval

Sheet 1 of 1

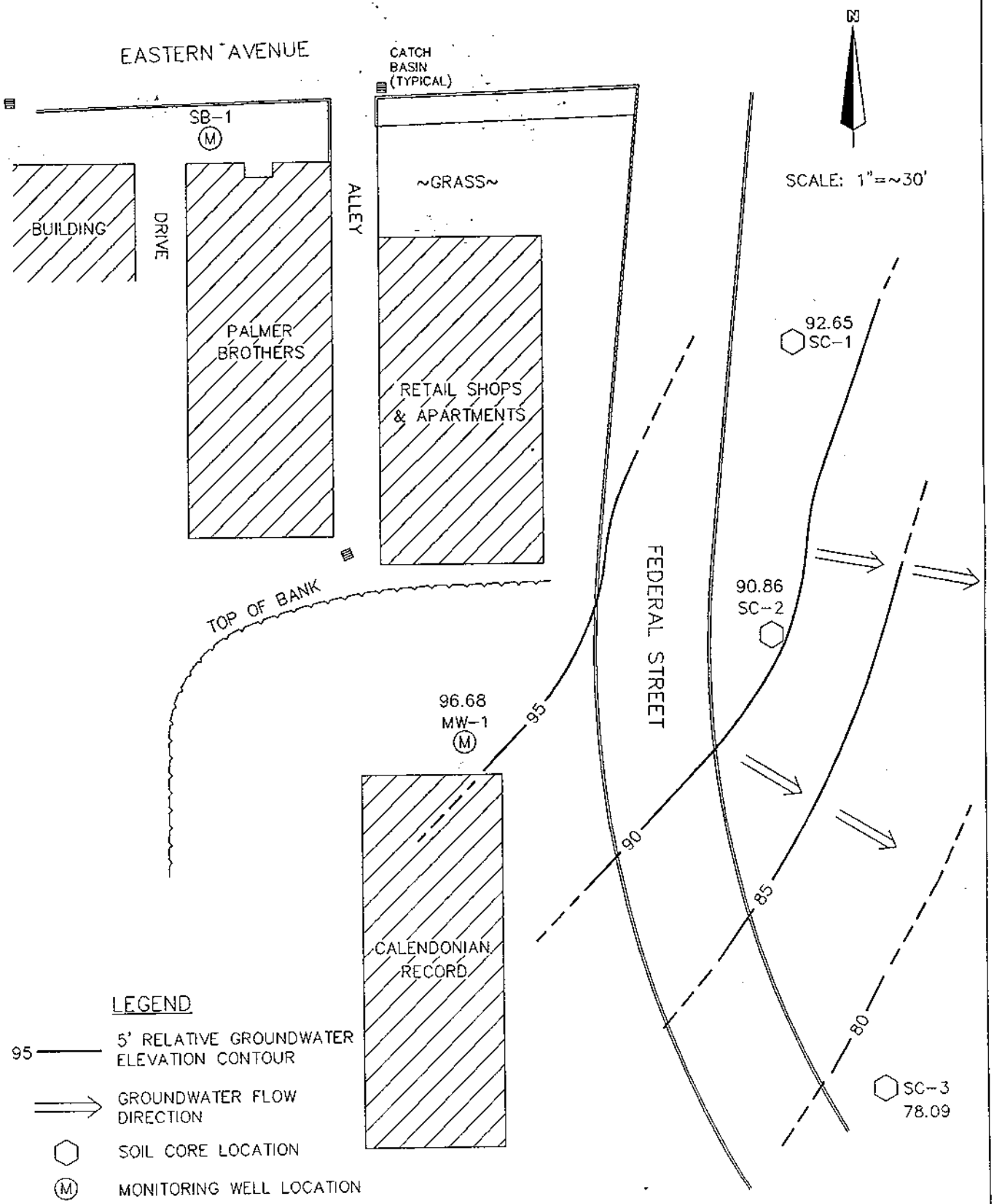


Attachment 6

Preliminary Groundwater Contour Map

1-1845-1\GWFLOW.dwg

NOTE: ALL LOCATIONS AND DISTANCES ARE APPROXIMATE.



ESTIMATED GROUNDWATER FLOW DIRECTION
PALMERS DRY CLEANERS
ST. JOHNSBURY, VERMONT

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Environmental Sciences and Engineering
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