Lone Rock Geoscience

75 Loomis Street, Burlington, Vermont 05401 (802) 862-4928

February 15, 1995

Mr. Matt Moran, Site Manager
Agency of Natural Resources
Department of Environmental Conservation
Hazardous Materials Management Division
Sites Management Section
West Office Building
103 South Main Street
Waterbury, Vermont 05671-0404

Re: Summary of Site Cleanup Activities at Claussen's Enterprises, Inc., Colchester, VT (Site # 94-1706)

Dear Matt,

This letter presents the results of the soil excavation and polyencapsulation effort conducted on December 19 and 20, 1994 at Claussen's Enterprises, Inc. on Route 2A in Colchester, Vermont. The site cleanup activities were conducted in order to mitigate the uncontrolled environmental release of petroleum to subsurface soils identified by Tim Cropley of the Technical Services Section of the Hazardous Materials Management Division of the Vermont Department of Environmental Conservation (VT DEC) on October 20, 1994. Site cleanup activities were conducted quickly as a direct result of your letter to Chris Conant (Claussen's Enterprises, Inc.) dated December 12, 1994. As required in your December 12 letter, the site cleanup work was completed within 15 days.

The following report includes a description of the setting of the release, a summary of the background information available regarding the nature and probable source of the release and a detailed description of the excavation activities aimed at removing the release impacted soils. The report is concluded with recommendations for periodic monitoring and further action, if deemed necessary at a later time.

Setting

The area of contaminated soil occurs at the property boundary between Claussen's Enterprises, Inc. and the Union Memorial School (operated by the Colchester School District). This location is depicted on the Site Location Map (Figure 1) and a 1:1250 scale orthophoto map (Figure 2). The area surrounding the Union Memorial School and Claussen's Enterprises, Inc. is relatively flat lying ground that slopes gently to the north-northwest and to the south-southwest (Figure 1).

According to the Soil Survey Of Chittenden County (SCS, 1974), the soils in the area surrounding the petroleum release consist of Adams and Windsor loamy sands at 0 to 5 percent slopes and Belgrade and Eldridge silt loams at 0 to 3 percent slopes. Adams-Windsor soils are deep, loose, excessively drained, high permeability sandy soils. Adams soils formed at the higher energy margins of the Champlain Sea, the marine incursion that flooded the Lake Champlain valley following deglaciation. According to The Surficial Geologic Map of Vermont (Stewart and MacClintock, 1970), the area of Adams sands is classified as "pebbly marine sand". Because of the drainage characteristics, the Adams series soils are well-aerated and reveal bright, oxidized colors. Belgrade series soils consist of silty very fine sandy loams characterized by a seasonal high water table, slow to moderate drainage and slow permeability. Belgrade soils developed on sediments deposited as bottom muds in the Champlain Sea. The Surficial Geologic Map of Vermont (Stewart and MacClintock, 1970) identifies the area of Belgrade soils as "marine clay". Because of the drainage characteristics, the Belgrade series soils are heavily mottled.

During site excavation activities it became apparent that the soils immediately underneath the spill site are clean, well-sorted and uniform Adams medium sands. At a depth ranging from 2 to 4 feet, the Adams sands were observed to be underlain by a dense, heavily mottled, very fine sandy silt loam consistent with the description of Belgrade series soils. (The areas mapped by the SCS as Belgrade soil are topographically lower than the area of the spill site suggesting that the map pattern of soils is the result of erosional removal of a previous Adams sand cap). As developed in sections below, the configuration of the soils imparts a strong influence on the distribution of the petroleum contamination in the subsurface.

Surface water drainage in the area surrounding the release site consists of the tributary drainages of Pond Brook to the north and Indian Brook to the south. Both brooks run from east to west into Mallet's Bay; Pond Brook intercepting Mallet's Creek in the Munson Flats area first. The area of the release occupies a drainage divide between the tributary drainages to Pond Brook and to Indian Brook (Figure 1) . As in most situations involving unconsolidated soils in Vermont, the presence of a surface water divide is likely to indicate the presence of a ground water divide in the subsurface. Location of the release site near a ground water divide could explain observations regarding the lateral uniformity of the contaminant distribution. This is discussed below.

Background

The area of the petroleum release had been used over the past several years by Claussen's Enterprises, Inc. for the temporary storage of 275 gallon aboveground fuel storage tanks (ASTs) removed from service. The ASTs, formerly used to fuel oil-fired hot air furnaces in the greenhouses, were systematically decommissioned as each greenhouse was connected to a natural gas fuel source. According to Chris Conant, the ASTs were taken out of service in an empty condition and moved to the storage area. After several years of decommissioning, approximately 12 ASTs were present at in the storage area (Conant, 1994).

According to the Cropley memo (10/24/94) the VT DEC received an anonymous phone call on June 18, 1993, alleging that 18 to 20 underground storage tanks had been removed from service at Claussen's Enterprises Inc. and that contamination found in an excavation had been buried. Erik Sandblom (VT DEC) visited the site and determined that only above ground storage tanks were present (not underground storage tanks) and that none of the tanks appeared to have leaked fuel onto the ground in the area of storage. Mr. Sandblom indicated, during a recent conversation, that he had prepared a detailed accounting of his visit to the site in an internal memorandum (Sandblom, 1994, personal communication). The Sandblom memorandum is not contained in the current VT DEC file #94-1706.

In the fall of 1993, the ASTs were hauled to Rhoades Enterprises in Milton. According to Chris Conant, during the loading operation in preparation for transport to Rhoades Enterprises, one of the 275 gallon ASTs slipped off the back of a truck and ruptured, releasing approximately 15 gallons of residual #2 fuel oil and water. This spill was reported to the VT DEC by Mr. Conant who was instructed on cleanup procedures. According to Chris Conant, several cubic yards of soil from the truck loading spill were amended with manure and fertilizer and stockpiled on polyethylene. Mr. Conant indicated that instructions received from VT DEC personnel directed Claussen's to thin spread the stockpiled soil after approximately nine months time. Mr. Conant indicated that the soils were thin spread, as directed, in the area of the previous AST storage, that is, in the area of the current remedial activity (Conant, 1994).

On September 28, 1994, a strong petroleum fuel odor was detected from surface soils by Warren Robenstein, an engineer placing a property boundary witness post between Claussen' and the Colchester School District properties. The Town Health Officer, Rocco Graziano, was notified. Mr. Graziano visited the location of the odor and verified the presence of a "sweet oily odor after digging down about 6 inches" (Graziano, 1994). Mr. Graziano notified Chris Conant and Cedric Sanborn at the VT DEC. On October 20, 1994, Tim Cropley of the VT DEC visited the site. Mr. Cropley installed 19 shallow soil borings with a soil auger and screened recovered soils for relative petroleum vapor concentration using a H-Nu photoionization detector (PID). Mr. Cropley generated a memorandum on 10/24/94 describing his observations on 10/20/94. The memo included a sketch map depicting the location of the soil auger

sampling points and the relative PID response to recovered soils. A reproduction of this map (with concentration values contoured) is included as 3. A copy of the 10/24/94 memorandum appears in Appendix I.

As a result of the Cropley memo, the Sites Management Section (SMS) issued a letter to Claussen's Enterprises, Inc dated 11/3/94 indicating the need for mitigation of the observed petroleum release (Speise, 1994). Due to miscommunication regarding the timeframe for cleanup response by Claussen's Enterprise, Inc. (no time line was included in the 11/3/94 letter), a second letter was issued on 12/12/94 requiring full implementation of cleanup activities within 15 days of letter receipt (Moran, 1994). Copies of the 11/3/94 and 12/12/94 letters appear in Appendix I.

Cleanup action was initiated on December 19, 1994 and concluded at the end of the following day. The following sections describe the soil cleanup activities.

Site Cleanup Activities

According to the November 3, 1994 VT DEC letter (Speise, 1994), Claussen's Enterprises, Inc. was required to retain the services of a qualified environmental consultant to "excavate any contaminated soils with PID readings in excess of 10 ppm and stockpile and polyencapsulate these soils in an area such that they have low potential to impact any sensitive receptors." Additionally, the remedial response required isolation of the stockpiled soils from children at the nearby schoolyard and preparation of a plan for monitoring and/or treating the excavated soils.

Cleanup activities relative to the removal and stockpiling of contaminated soils were designed and implemented in accordance with the *"Agency Guidelines for Handling Petroleum Contaminated Soil and Carbon Media"* (*"Guidelines"*, VT DEC, 1992). Because the fuel stored in the ASTs formerly located in the area of the release was # 2 fuel oil, it was presumed that the petroleum contamination discovered in the surface and subsurface soils of the Claussen's Enterprises, Inc. property was also # 2 fuel oil. Consequently, the PID vapor threshold for segregating soils which may be backfilled from soils needing treatment (as in the *Guidelines*) was pre-determined to be 10 ppm (VT DEC letter, 11/3/94).

The locale surrounding the area of the release is a portion of the Claussen's Greenhouse facility used for the storage of miscellaneous material (i.e. scrap lumber, pallets, wooden reels, etc.)(Photos 2, 7 and 10). Prior to initiating the excavation and polyencapsulation of contaminated soils, an inspection of the surrounding area was conducted for sensitive receptors. **No homes or drinking water supplies are located nearby.** A large building structure to the east of the release area, seen in Photos 7 & 9, is a warehouse used to store items held for auction. **The dwellings in the local area are served by municipal water served by the Champlain Water District.** The northwest corner of the Union Memorial Elementary School is located approximately 250 feet to the south of the release area. The land surface between the school and the area of the release is wooded with low undergrowth. At the time of the cleanup, children from the school were observed to be playing on the grounds to the east of the school building; at distance from the area of the release. **Although no physical barrier precludes children from making their way to the area of the release, they are not brought in contact with this area as a matter-of-course during normal playtime activities. In order to prevent the possibility that a stray school child could enter the area of the proposed stockpile, a four foot wooden fence with warning signs has been placed around the perimeter of the soil stockpile.**

The ground surface in the area of the release was found to be flat-lying with a small (4 foot) sand ridge oriented in a north south direction immediately to the east of the witness post (Figure 3 and Photos 8 and 10). A small, shallow drainage swale starts at the base of this small sand rise approximately 50 feet north of the area of the excavation. (Photo 2) This swale runs to the north and deepens with separation distance from the area of the release as it heads toward the drainage ravine tributary to Pond Brook. At the time of the excavation, the base of the drainage swale was dry. No evidence was found in the base of the swale or in sediments or stream waters at the confluence with the Pond Brook tributary that petroleum from the area of the release had impacted this surface water.

The only receptors appeared to be the subsurface soils and ground water beneath the area of the release. The absence of substantial sensitive receptors was consistent with Mr. Cropley's determination that "No receptors seem to be present." (10/24/94 letter). In light of the apparent absence of sensitive receptors, a place was located immediately to the north of the release site for the construction and maintenance of a polyencapsulated soil pile. This location was selected because it is located away from the public- accessible portions of the Claussen's property, is "out of the way" of normal greenhouse operations, is easily accessed from the Claussen's property for the purposes of monitoring petroleum degradation and the integrity of security fencing and because it afforded easy transfer of contaminated soil from the excavation area to the treatment area. The location of the stockpile is depicted in 5 and Photos 9 and 10.

Excavation and polyencapsulation of the fuel contaminated soils was accomplished on December 19 and 20, 1994. The area of contamination defined by Tim Cropley was opened for initial inspection by the installation of 7 test pits (Photo 1). The purpose of the test pits was to expose subsurface soils for PID vapor screening. The location of the test pits and the values of PID maxima are depicted relative to the contoured Cropley data in Figure 4. As depicted in Figure 4, the test pits were installed at intervals to establish a crude perimeter of soils registering greater than 10 ppm on the PID.

Initial test pits with soils registering a PID response greater than 10 ppm (Figure 4) were excavated laterally and connected to begin the soil excavation (Photo 2). Soils greater than 10 ppm on the PID were excavated from the pit and stockpiled at the pit edge. During stockpile growth, bark mulch and dehydrated cow manure were added to the pile in an effort to provide additional nutrients and substratum to enhance microbially induced degradation of the petroleum contaminating the soil. An estimated mass of approximately 2 tons of manure and 3 tons of bark mulch were added and incorporated into the soil stockpile. After a sufficient volume of soil amended with bark mulch and manure had piled up on the side of the pit, the soils were relocated onto a large sheet on 6-mil polyethylene (measuring 100 ft X 50 ft). Adding the mulch and manure during excavation allowed mixing when the contaminated soils were moved to the poly.

A PID was used to measure the relative concentrations of organic vapors from the soils recovered from the excavation. The PID used was an Hnu ® PI-101 with a 10.2 electron volt (eV) UV ionization lamp. Prior to use each day, the Hnu was calibrated to a benzene reference using 100 ppm isobutylene calibration standard gas. During the soil excavation and sample collection the ambient temperature was 25°F with a 10-15 mph gusting wind (wind chill of 10 to 2°F). In order to ensure proper operation of the PID, it was placed in a warm automobile during excavation activities (Photo 3). Soil samples were recovered from the excavation and were placed into new ziploc freezer storage bags. Approximately one-half of the bag volume was filled with soil. Proper vapor screening with the PID required that ziploc bags containing sampled soils be warmed prior to headspace analysis (in accordance with the *Guidelines*). Ziploc bags with soils were placed on the floor of the car near the heater (Photo 3). After five minutes time, the maximum vapor concentration of the headspace in the ziploc bags was recorded.

During site excavation, the exposed soil was observed to consist of well-sorted medium sand in sharp contact with an underlying very fine sandy silt (Photos 4 and 5). This stratigraphy represents the Adams over Belgrade soils described previously. A thin (~3 inch) perched water table was observed to flow out of the sand above the silt contact. The area of perched water was highly oxidized (Photo 4) probably as the result of seasonally fluctuating water table elevations. The perched water flowed slowly out of the sand above the contact so that when freshly exposed (Photo 5) the contact was "dry". After several minutes time, the contact began to seep, eventually resulting in ground water flow out of the exposed excavation face (Photo 4). The petroleum contamination was observed to be concentrated in the thin saturated zone above the silt. This zone of greater contamination was characterized by a change in the bright orange to yellow-brown color of the sands to a grey color. This color change represents the chemical reduction of the normally oxidized iron compounds coating the sand grains as the result of oxygen scavenging by the organic contamination (Domenico & Schwartz, 1990). The concentration of the petroleum contamination in the thin zone of saturated sands suggests that ground water transport above the silt has resulted in the lateral spread of the fuel oil.

Soil samples were collected at several locations to compare the relative vapor concentration of the sandy soils with those of silty soils found immediately below. Based upon the results of these comparisons {e.g. samples 2 (silt) vs. 4 (sand) and 10A (silt) vs. 10B (sand) in Figure 4}, the PID response several inches into the silt was found to decrease rapidly. One comparison sample (16 and 16 silt - Figure 5) however, did not display this characteristic. 16 silt revealed 20 ppm PID response at a depth of 6 inches below the contact. The PID response tapered off quickly below 12 inches depth for the 16 sampling location. Although the petroleum contamination appeared to be concentrated in the sands immediately above the contact with the silt, the sporadic presence of greater than 10 ppm concentrations in the first foot of the silt was cause for concern. As a contingency, the depth of excavation was increased to extract 18 to 24 inches of the silt. Vapor concentrations above 10 ppm were not found below this depth in the silt layer.

The concentration of the contamination in the thin saturated zone is consistent with an interpretation that the contamination has spread laterally from points of initial introduction by flow along the perching silt. Suggested locations of initial introduction points are the "hot spots" that appear when the Cropley data are contoured (Figure 3). During excavation activities, several areas of the excavation were found to have greater relative vapor concentrations, perhaps suggesting points of introduction.

The lateral dispersion of the contamination from inferred points of original introduction is the likely consequence of the permeability contrast between the sand and the silt. Rather than penetrate the slowly permeable silt, the contaminated perched water would tend to flow laterally within the more permeable medium sands. During the excavation, it appeared as though the contact between the sands and the silts was relatively flat-lying. The flat-lying nature of the top of silt may explain the crude "bulls-eye" pattern displayed by the contoured relative concentration data (Figure 3).

Soils were removed from the pit until excavation sidewalls yielded soils at the sand / silt contact that registered a response on the PID that was less that 10 ppm. In a general sense, this could almost be predicted by the presence or absence of the reduced (gray) sand layer at the perched water table. After the 10 ppm boundary had been determined for the eastern, southern and western excavation sidewall, a test pit was installed beyond the northern excavation boundary. This test pit yielded satisfactory PID response levels (< 10 ppm). The soils at the northern boundary of the excavation were removed to the test pit wall and excavation ceased.

The soil stockpile generated as the result of the excavation activities measured approximately 40 feet X 22 feet with a height of about 7 feet. Based upon an angle of repose of 40 degrees (steepened relative to dry soil by the presence of the silty material, the moisture content and the added bark mulch and dehydrated manure), a calculation of the volume of soil removed can be estimated at approximately 84 cubic yards (Figure 6). This is approximately equivalent to the volume estimated in the 10/24/94 Cropley letter (35 feet X 35 feet X 2 feet = 2450 ft^3 = 90.74 yds^3).

After completion of the soil excavation, the stockpiled soils were surveyed for vapor concentration using the PID. The methodology for sampling involved penetrating the soil stockpile with a stick approximately 18 inches into the soil pile, withdrawing the stick and then placing the tip of the Hnu probe into the resulting hole. PID response maxima were then recorded. The distribution of vapor concentrations so obtained are depicted in Figure 7.

The completed soil stockpile was covered by the remaining portion of the polyethylene sheeting. The Prior to covering, the polyethylene sheeting exposed at the base of the stockpile was folded up onto the pile and secured in place with clean soil. Then the cover sheeting was draped over the pile and secured, covering and protecting the underlying polyethylene folded around the base of the pile. This configuration completely envelops the soil pile allowing it to shed precipitation without allowing seepage to enter the stockpile base.

excellent

After completion of the excavation activities, the open pit was infilled with 10 truckloads of clean sand fill which was leveled to the previous grade.

Proposed Stockpile Monitoring

In order to evaluate the effectiveness of the polyencapsulation treatment, quarterly visits to the soil stockpile are proposed for the purpose of testing interior soils for vapor concentrations using a PID. The testing procedure will require uncovering the stockpile. The monitoring will involve collecting a sample of soil from a depth of 12 to 18 inches beneath the stockpile surface with a pig-tail or bucket soil auger. The soil sample will be placed in a clean glass sampling jar with a foil "lid". After several minutes for an equilibration of the jar headspace, a PID probe will be introduced to the jar by puncturing the foil lid. The maximum PID reading will be recorded and the location of the sample will be indicated on a map of the stockpile surface.

Quarterly testing is proposed in order to collect data regarding the rate of contaminant degradation and the influences of seasonal changes in ambient temperature, humidity and photoperiod. After one year of monitoring data have been collected, the data will be reviewed to determine if a significant decline in petroleum vapor concentrations has been achieved. In the absence of significant vapor concentration decline after a one year incubation, laboratory chemical characterization and/or additional treatment options (such as soil vapor extraction, or landfarming) may then be considered.

Summary

In response to a letter from the VT DEC requiring cleanup of petroleum impacted soils, Claussen's Enterprises Inc. has conducted an excavation to remove soils from the ground. Soils were screened by a photoionization detector for the presence of volatile organic compounds at the time of removal. Soils registering a PID response in excess of 10 ppm were segregated for treatment. Soils registering less than 10 ppm were backfilled. Segregated soils were mixed with dehydrated manure and bark mulch to enhance biodegradation and were stockpiled on a single sheet of 6-mil polyethylene. An estimated volume of 85 cubic yards are contained in the stockpile. After removal of all soils exceeding 10 ppm on the PID, the stockpile was covered and secured with polyethylene. A 4 foot wooden fence with "Keep Out" signs has been placed around the perimeter of the stockpile to prevent trespass. The excavation pit was filled with 10 truckloads of clean sand fill.

This completes the report for the soil cleanup conducted at Claussen's Enterprises, Inc. Please do not hesitate to call me at 802-862-4928 if you have any comments or questions regarding the information provided in this report.

Sincerely,

Ronald L. Parker,
Principal Geologist
LONE ROCK GEOSCIENCE

RLP/rlp
Attachments : References
Figures
Photos
Appendix

CC: Chris Conant, Claussen's Enterprises, Inc.
Rocco Graziano, Colchester Health Officer
Larry Decker, Colchester School District
Michelle Penca, Colchester School Board Chair

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REFERENCES

Conant, Chris (1994) Letter to Roger Bourassa, Colchester School District Superintendent dated 10/5/94

Cropley, Tim (1994) VT DEC In house Memorandum to Chuck Schwer, 10/24/94.

Domenico, Patrick A. and Franklin W. Schwartz, 1990. **Physical and Chemical Hydrogeology**, New York: John Wiley & Sons, 824 pp.

Graziano, Rocco (1994) Letter to Roger Bourassa, Colchester School District Superintendent dated 10/3/94

Moran, Matt (1994) Letter to Chris Conant, Claussen's Enterprise, Inc. dated 12/12/94

Speise, Richard (1994) Letter to Chris Conant, Claussen's Enterprise, Inc. dated 11/3/94

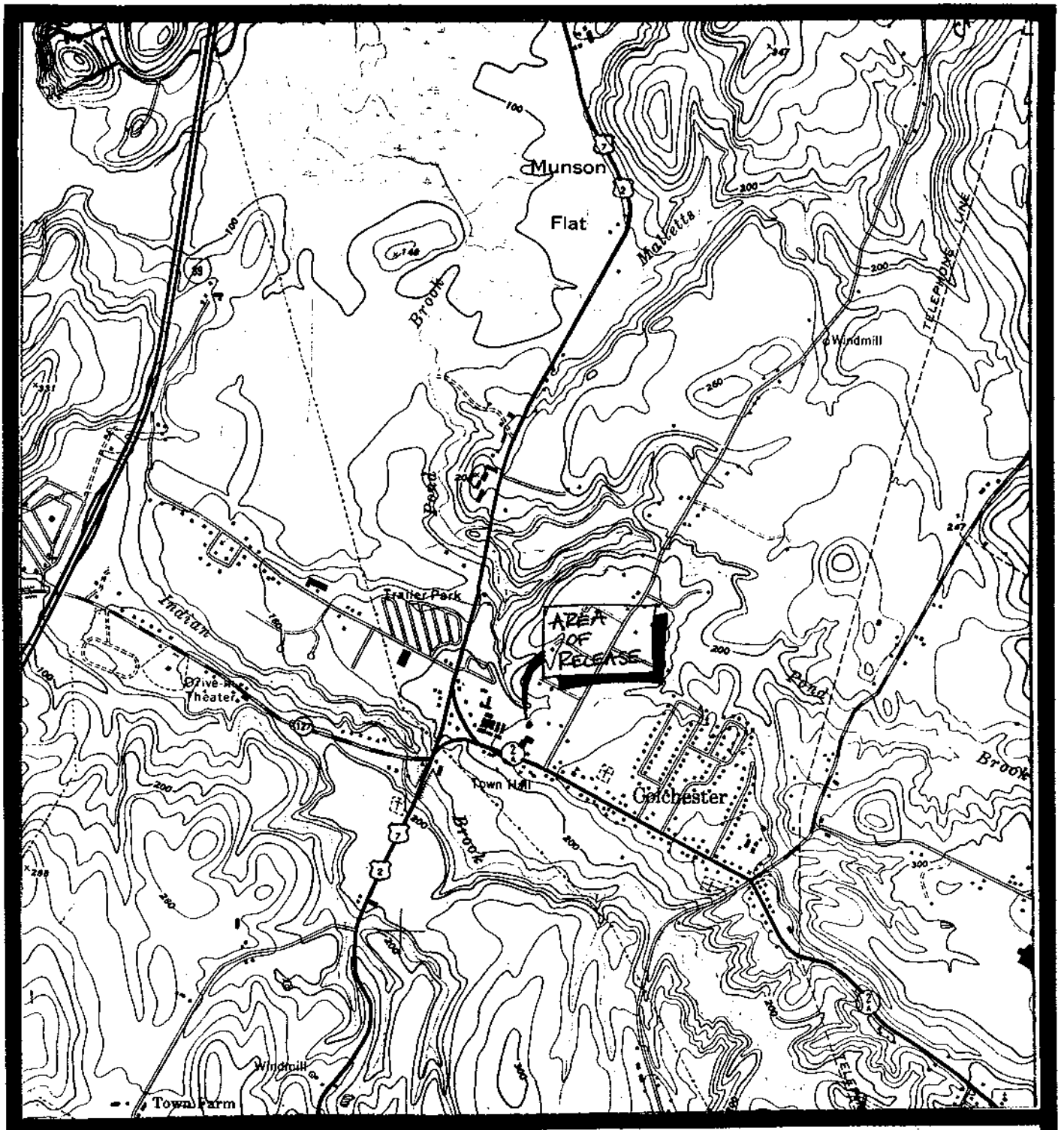
Stewart, David and Paul MacClintock (1970) *Surficial Geologic Map of Vermont*, Vermont Geologic Survey.

United States Soil Conservation Service (1974) *Soil Survey of Chittenden County, Vermont*, United States Department of Agriculture.

Vermont Department of Environmental Conservation (1991) *Guidance Documents to Evaluate and Remediate Hazardous Waste Sites,* Hazardous Materials Management Division, Sites Management Section, May 1994

Vermont Department of Environmental Conservation (1992) *"Agency Guidelines for Handling Petroleum Contaminated Soil and Carbon Media"*, Hazardous Materials Management Division, Sites Management Section, August 3, 1992.

FIGURES



North

Site Location Map

Claussen's Enterprises, Inc

Scale 1:24,000 (1 inch = 2000 feet)

FIGURE 1

LRG # 94578

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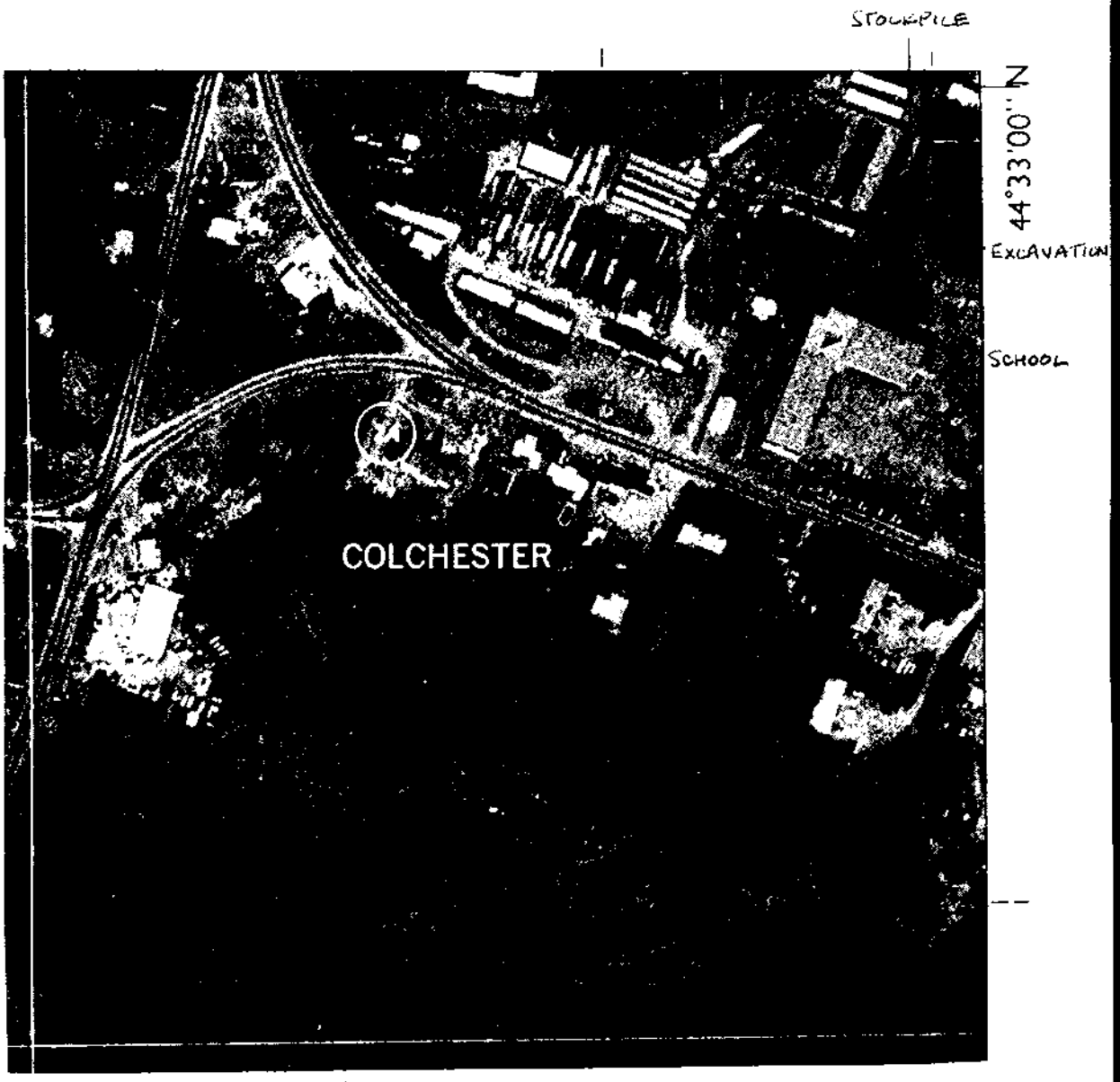


North

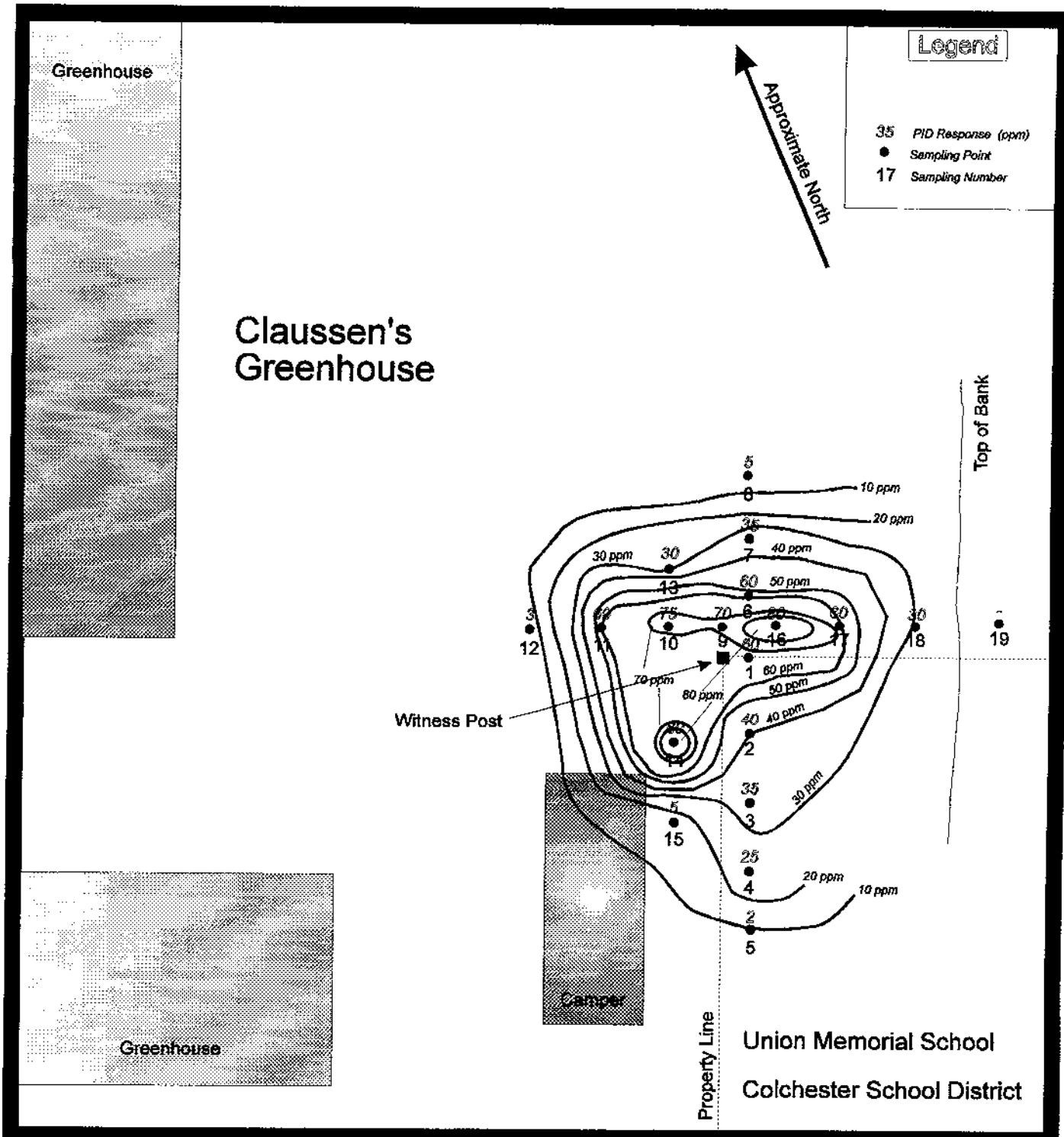
Orthophoto Map

Claussen's Enterprises, Inc

Scale (1 inch = 300 feet)

FIGURE 2

LRG # 94578

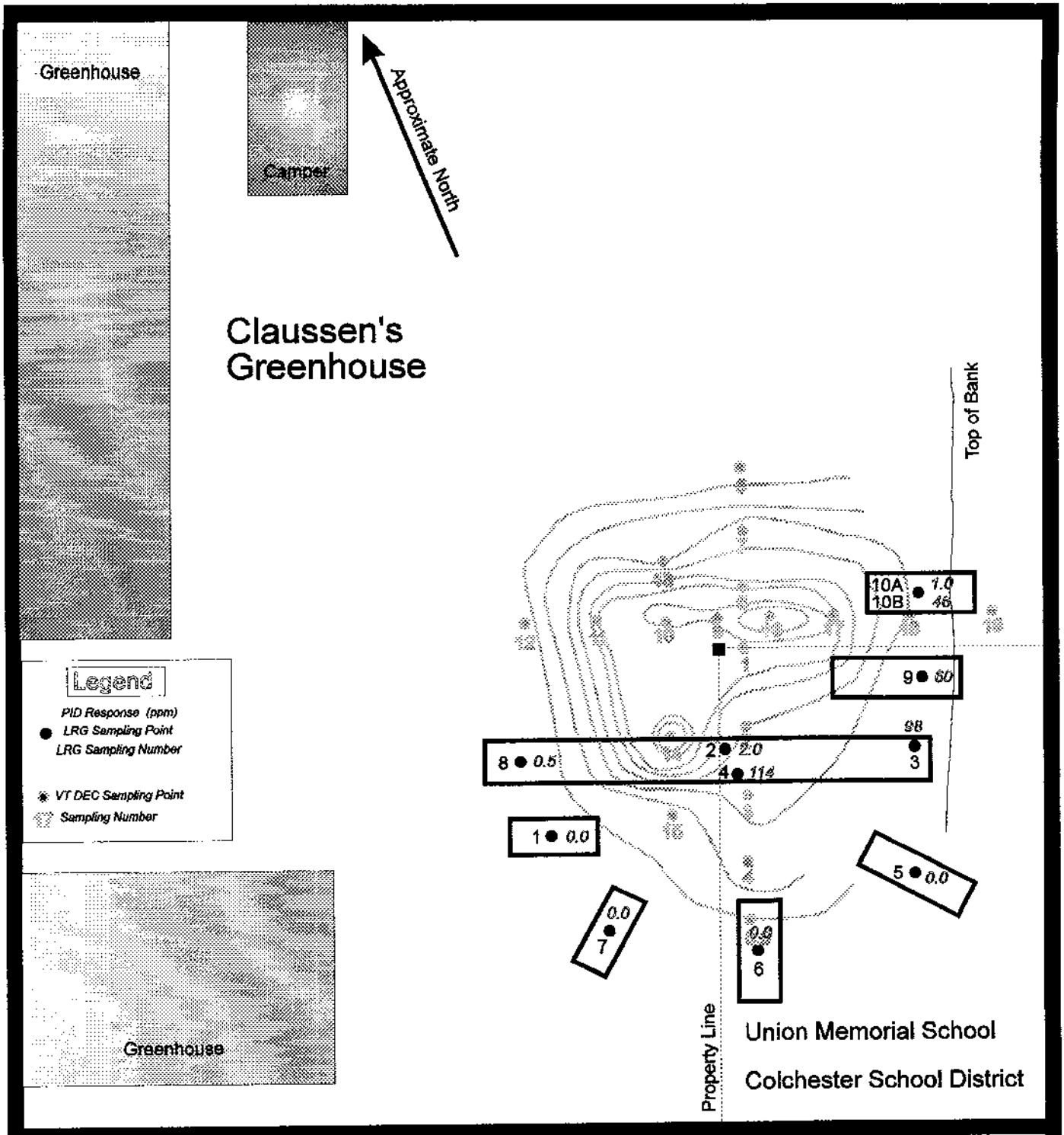


PID Response Data Contoured from the Map Entitled

Claussen's Florist and Greenhouse Complaint Investigation

dated October 20, 1994, by Tim Cropley (VT DEC)

FIGURE 3



Initial Investagatory Test Pits Installed December 19, 1994 at the Onset of the Petroleum Contaminated Soil Excavation

Claussen's Greenhouse Property, Colchetser, Vermont

FIGURE 4

Project # 9457

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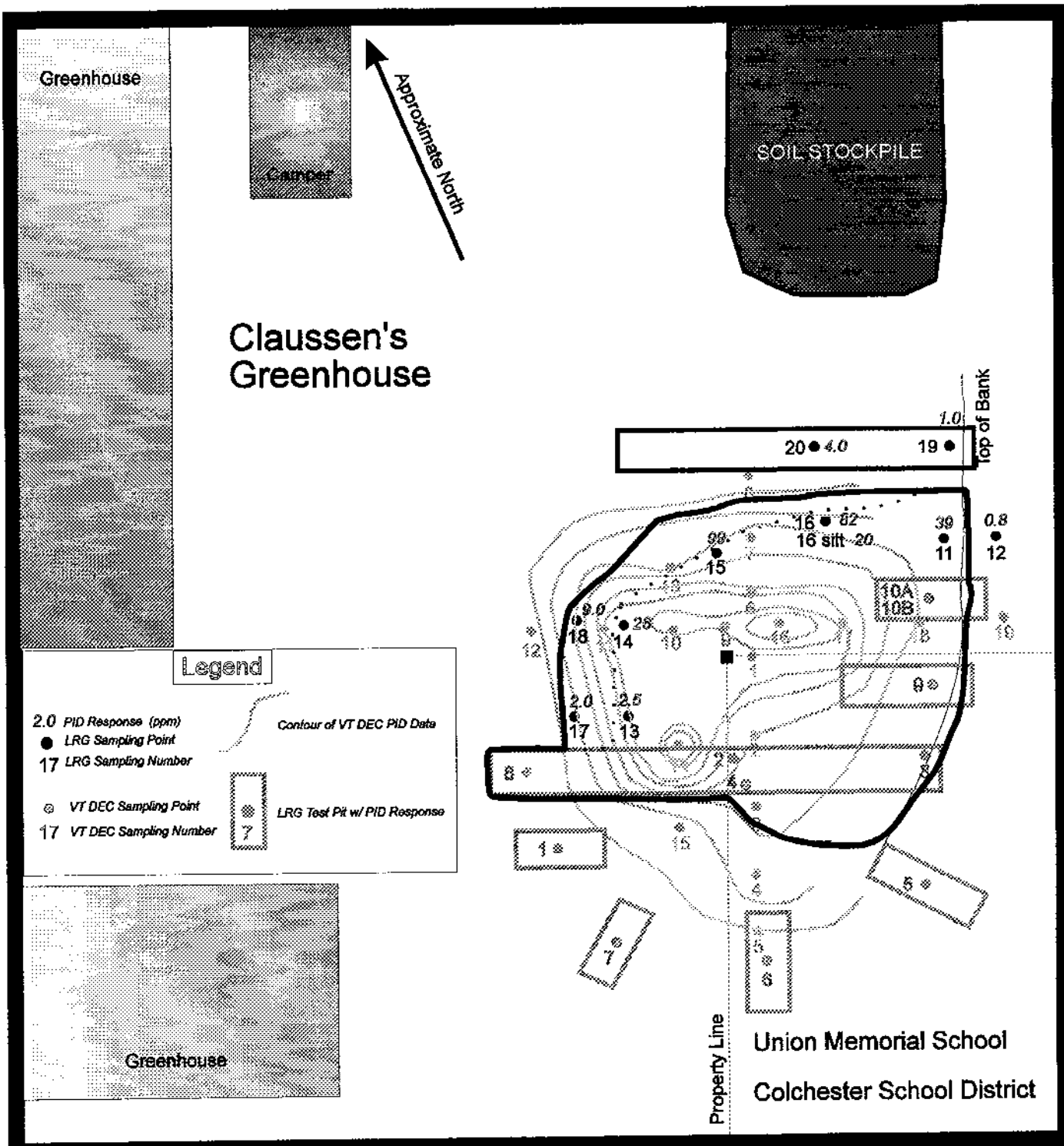

Limits of the Petroleum Contaminated Soil Excavation

Claussen's Greenhouse Property, Colchester, Vermont

December 19th and 20th, 1994

Project # 9457

FIGURE 5

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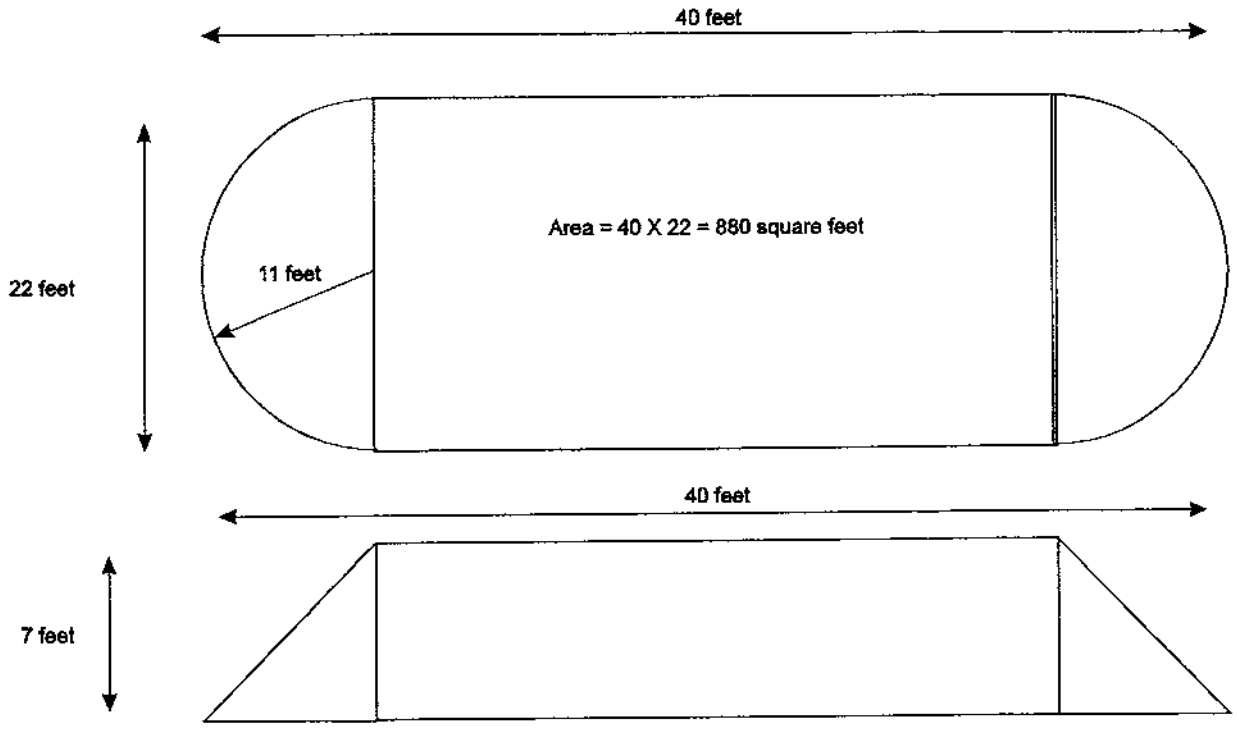

Volume of conical ends of the pile are calculated by placing each end together to form a single cone:

The volume of a right circular cone is given by: $V = 1/3\ \pi r^2 h = 1.047\ r^2 h$

$= 1.047\ (121) \times (7)$

$= 886$ cubic feet

The volume of the center of the pile is given by 1/2 bh x l x w

$= 11/2 \times 7 \times 40$

$= 1540$ cubic feet

$$886 + 1540 = 2426 \text{ cubic feet} \times \frac{\text{cubic yard}}{27 \text{ cubic feet}}$$

$= 89.9$ cubic yards

Stockpile Volume Calculations Based upon Field Measurements of Dimension

Claussen's Enterprises, Inc

not to scale

North

FIGURE 6

LRG # 94578

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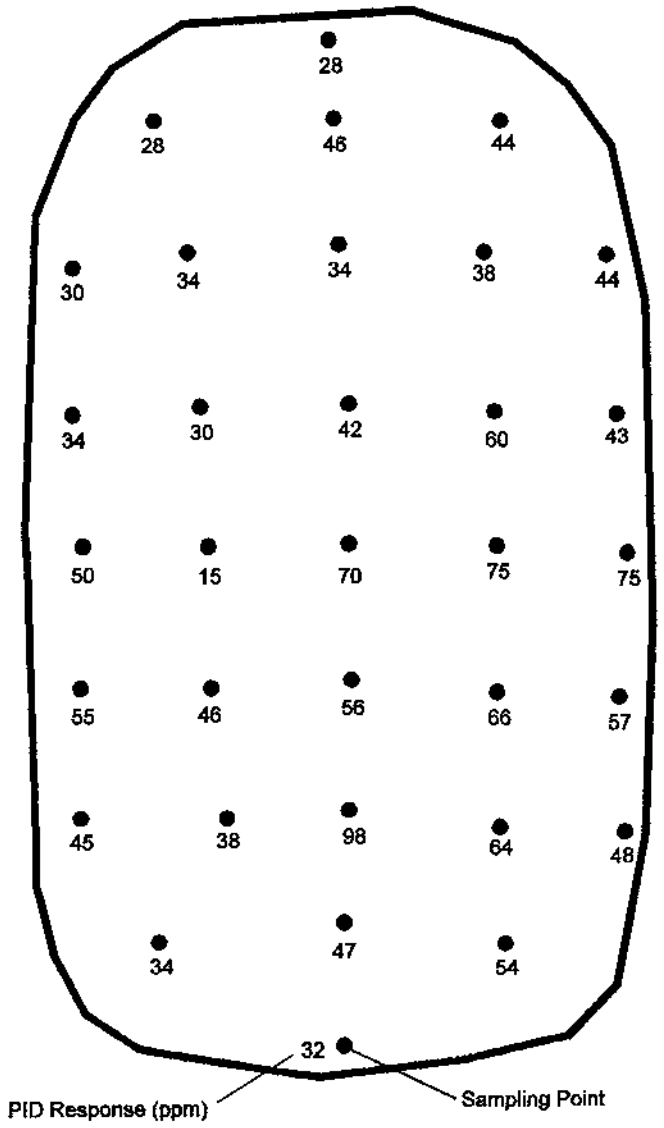

Stockpile Initial Vapor Concentration Map

Claussen's Enterprises, Inc

FIGURE 7

LRG # 94578

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PHOTOS

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Photo 1: Initial test pit installed to track the lateral boundaries of petroleum contaminated soil. Test pit excavated through the overlying sands into the very fine sandy silt below. Several of these test pits were installed at intervals to establish a crude perimeter of soils registering greater than 10 ppm on the PID. 12/19/94. RLP

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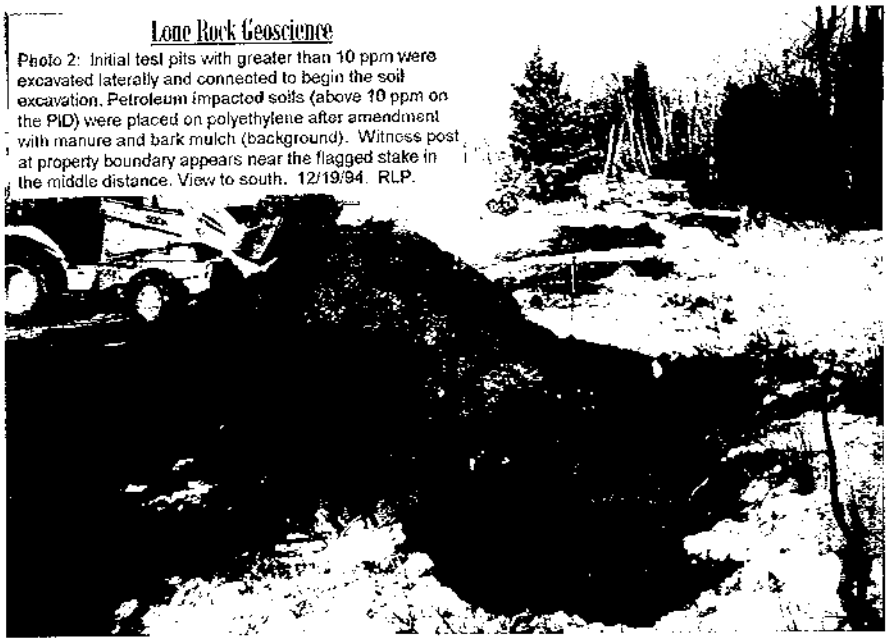
Photo 2: Initial test pits with greater than 10 ppm were excavated laterally and connected to begin the soil excavation. Petroleum impacted soils (above 10 ppm on the PID) were placed on polyethylene after amendment with manure and bark mulch (background). Witness post at property boundary appears near the flagged stake in the middle distance. View to south. 12/19/94. RLP.



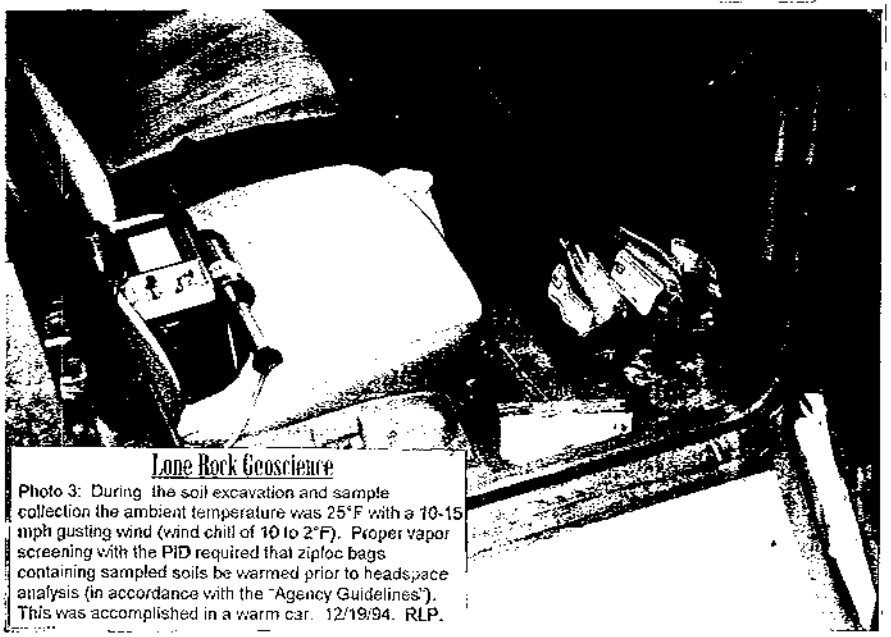


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Photo 3: During the soil excavation and sample collection the ambient temperature was 25°F with a 10-15 mph gusting wind (wind chill of 10 to 2°F). Proper vapor screening with the PID required that ziploc bags containing sampled soils be warmed prior to headspace analysis (in accordance with the "Agency Guidelines"). This was accomplished in a warm car. 12/19/94. RLP.

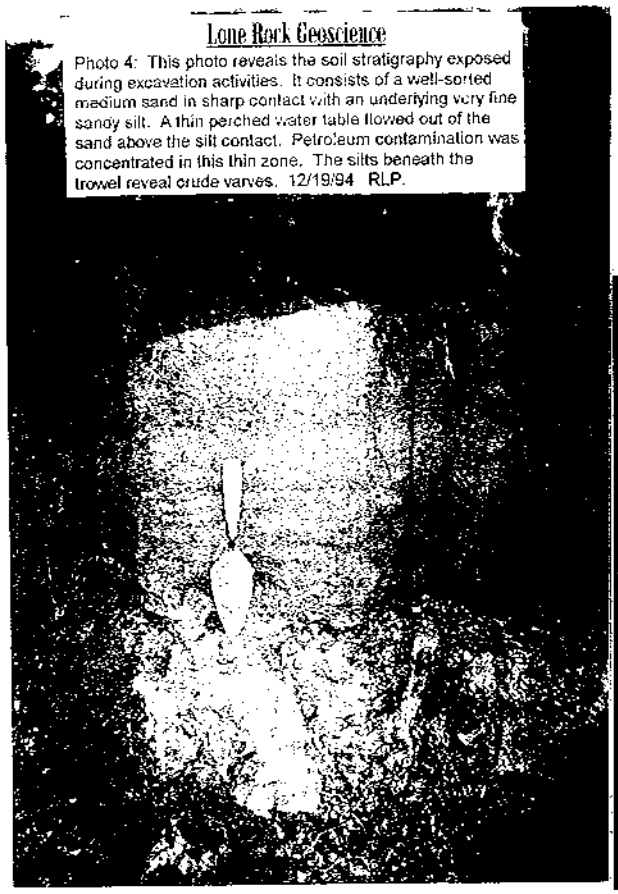

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Photo 4: This photo reveals the soil stratigraphy exposed during excavation activities. It consists of a well-sorted medium sand in sharp contact with an underlying very fine sandy silt. A thin perched water table flowed out of the sand above the silt contact. Petroleum contamination was concentrated in this thin zone. The silts beneath the trowel reveal crude varves. 12/19/94 RLP.

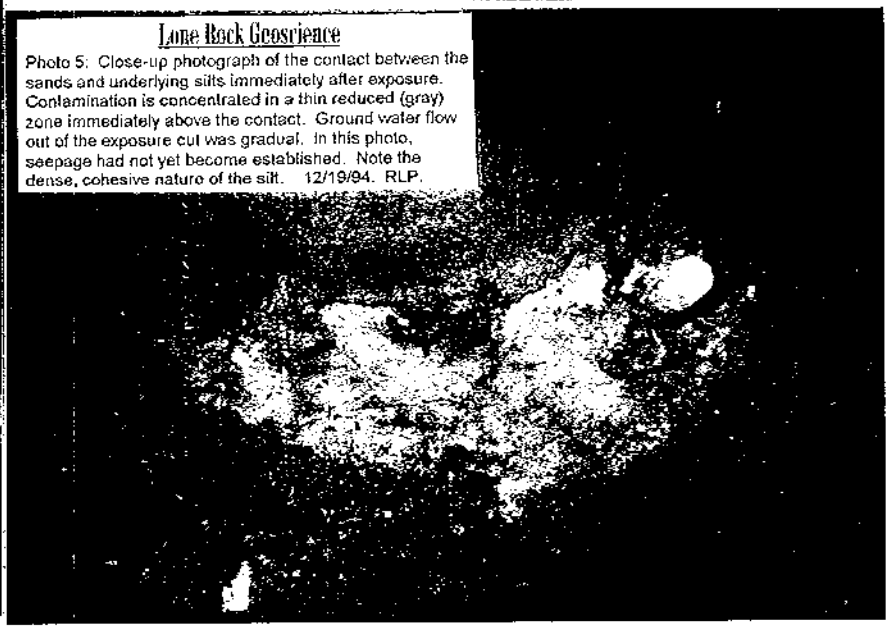

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Photo 5: Close-up photograph of the contact between the sands and underlying silts immediately after exposure. Contamination is concentrated in a thin reduced (gray) zone immediately above the contact. Ground water flow out of the exposure cut was gradual. In this photo, seepage had not yet become established. Note the dense, cohesive nature of the silt. 12/19/94. RLP.

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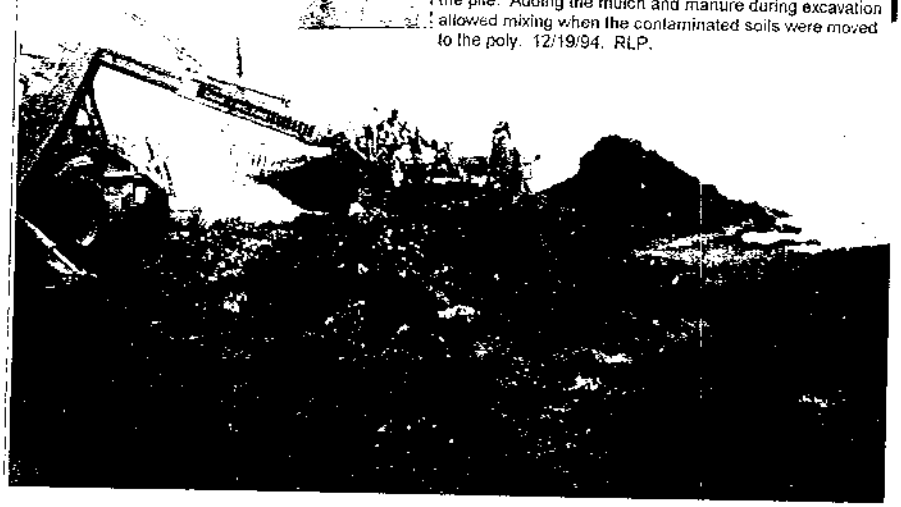
Photo 6: Soils greater than 10 ppm on the PID were excavated from the pit and stockpiled at the pit edge. During stockpile growth, bark mulch (background pile) and dehydrated cow manure (yellow bags) were added to the pile. Adding the mulch and manure during excavation allowed mixing when the contaminated soils were moved to the poly. 12/19/94. RLP.



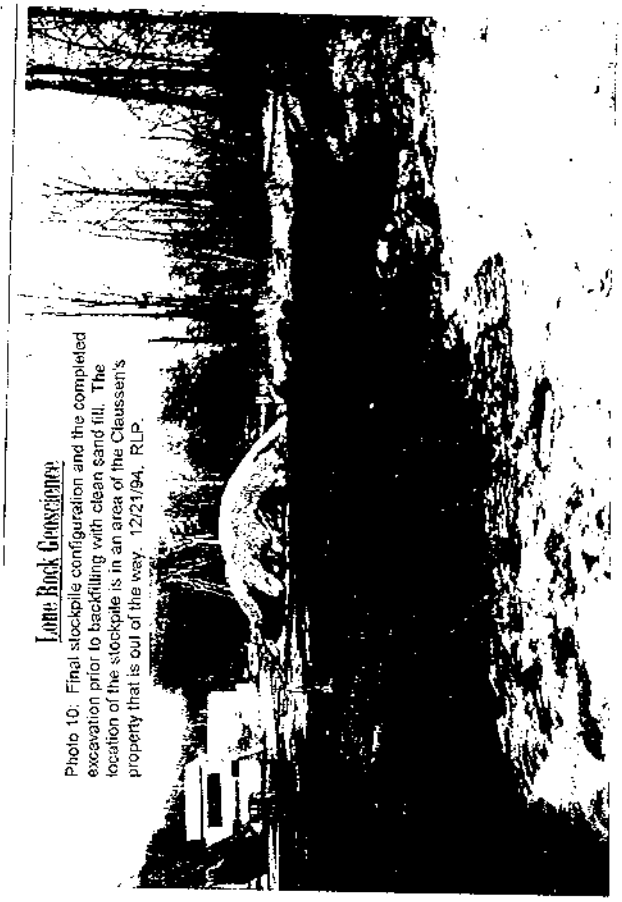


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Photo 10: Final stockpile configuration and the completed excavation prior to backfilling with clean sand fill. The location of the stockpile is in an area of the Claussen's property that is out of the way. 12/21/94. RLP.

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Photo 7: After adding bark mulch and dehydrated manure, the amended soils were moved onto greenhouse grade 6-mil polyethylene sheeting measuring 50' X 100' in dimension. Care was taken during transfer operations to prevent the puncture or tearing of the poly. 12/19/94. RLP.

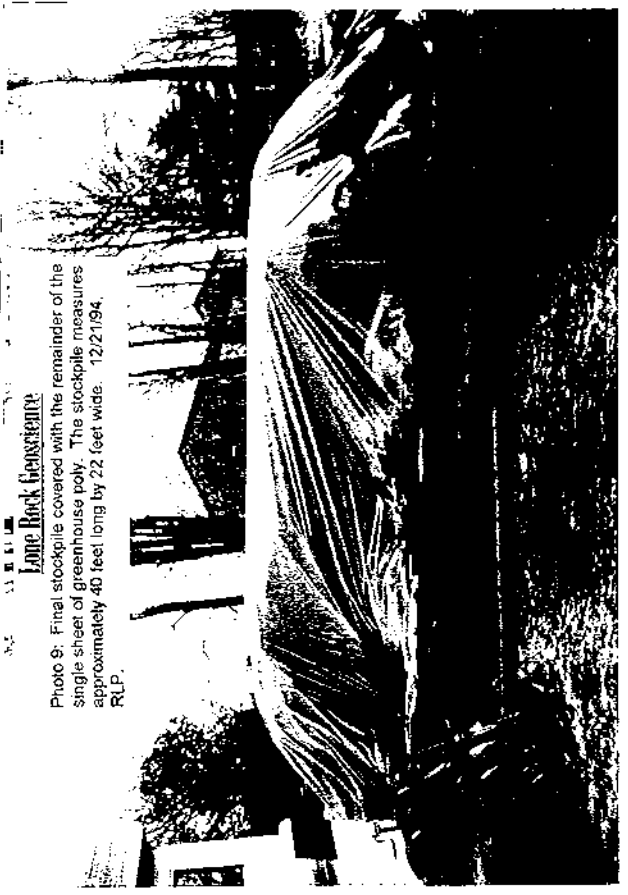

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Photo 9: Final stockpile covered with the remainder of the single sheet of greenhouse poly. The stockpile measures approximately 40 feet long by 22 feet wide. 12/21/94. RLP.

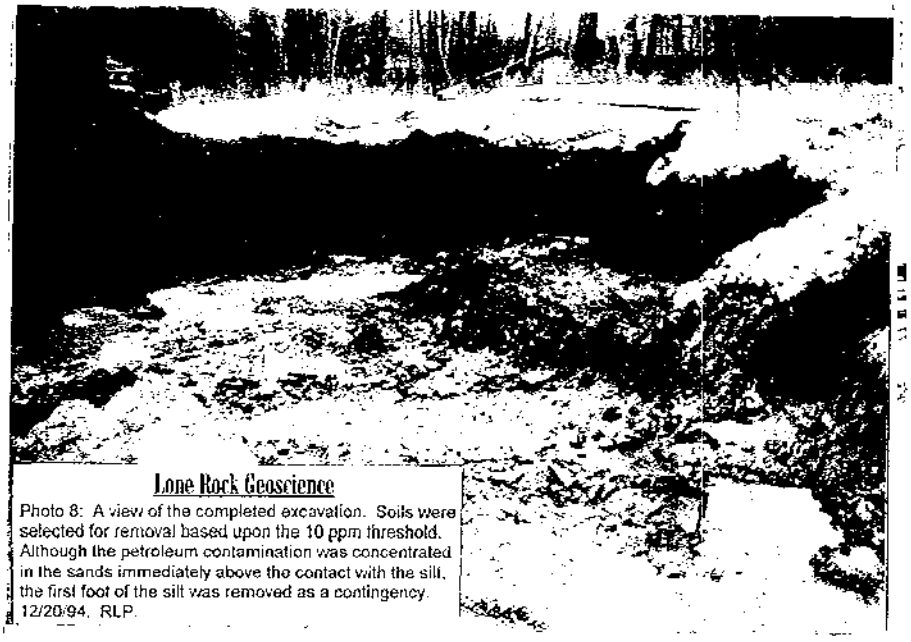

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Photo 8: A view of the completed excavation. Soils were selected for removal based upon the 10 ppm threshold. Although the petroleum contamination was concentrated in the sands immediately above the contact with the silt, the first foot of the silt was removed as a contingency. 12/20/94. RLP.

APPENDIX

94-1706

M E M O R A N D U M

TO: Chuck Schwer, Acting Chief
Sites Management Section

THRU: Cedric Sanborn, Chief
Technical Services Section

FROM: Tim Cropley, Asst. Hazardous Materials Specialist TC
Technical Services Section

DATE: October 24, 1994

SUBJECT: Claussen's Greenhouse - Colchester

On June 18, 1993, I received an anonymous call informing me that 18 - 20 small fuel oil USTs were removed from Claussen's Greenhouse on Rt. 2A near the junction of Rt. 7 in Colchester and that contamination was found but the excavation was filled in (see spill file #93-168).

Erik Sandblom visited the property within a few days of when the call was received and determined that there were only above ground tanks removed from service at the site. I have not found any documentation of Erik's site visit in the spill file but did confer with him with regard to his visit. He informed me that the tanks were above ground tanks and that inspection of the area around the tanks did not reveal any spillage on the ground. The tanks were removed from service and stored at the edge of Claussen's property, which is adjacent to the Union Memorial School property, until they were taken off site. There was reportedly still product in the tanks and it is hypothesized that when the tanks were loaded and removed, material in the tank was spilled and then leached into the ground. Chris Conant, manager of the greenhouse, stated that some of the soil was removed and stockpiled and that some fertilizer and manure was mixed in with it. I don't recall mention of what was done with these soils after that.

In late September 1994, Cedric Sanborn received a phone call from Rocco Graziano - Colchester Health Officer, concerning the discovery of petroleum vapors while a contractor for the Colchester School District was installing a property marker between the Claussen's and Union Memorial School's properties. The contractor noted a petroleum odor after digging down only 6 inches on the property line. Mr. Graziano went to the site and confirmed this. Cedric informed Mr. Graziano that a representative would come out to investigate.

On October 20, 1994, I visited the property to investigate this most recent complaint. Upon arriving at the property, I was taken to the area where the property marker was installed and began boring with a bucket auger. Fuel oil vapors were detected at as little as six inches below grade. The soils in this area are all sand which explains the mobility of the vapors in the soil. I did not perform a depth profile of the concentration of vapors (though did detect an increase in vapors with depth) but was more concerned with finding the area and depth at which the concentrations were the highest. After augering to a depth of 2 to 2.5 feet I encountered water saturated soils and then a layer of clay. I did not attempt to auger deeper and recorded an Hnu reading of 50-60ppm at this location. I then decided to auger at various locations to the clay layer to find the hot spots and find the lateral extent of the contamination. The results of my work are indicated on the site map attached.

On Boring 19 the Hnu stopped working properly, however, there was a fuel oil odor in the soil but at an apparent lesser concentration than Boring 18. Clay was encountered in Boring 19 at an elevation which appeared to be higher than the other borings. It is my believe that this should impede further lateral migration of contaminants towards the drainage swale on the other side of the bank. Since the soils are very permeable and there exists a layer of clay only 2 - 2.5 feet below grade, it is my belief that the contamination present will continue to spread laterally towards the north, south, and somewhat towards the west with no further migration towards the east due to the bank. This conclusion is based on the way the contamination has somewhat uniformly spread towards the north and south but has spread very little west of the high concentrations found in Boring 11. The area affected by the fuel oil at this time is approximately 35 feet by 35 feet. No receptors seem to be present.

Due to the extent of the contamination present, I am referring this matter to the Sites Management Section for follow up work. Please review the information provided and inform Claussen's of what will be required of them to mitigate the situation. They expressed an interest in possibly taking action to remediate this situation prior to the ground freezing.

Please address correspondences:

Claussen's Florist and Greenhouse
Attn: Chris Conant
PO Box 2007
Colchester, VT 05449

Phone # 878-2361/4286
or 1-800-287-2361

In addition please send copies of any correspondences to:

Colchester Town Office
Attn: Rocco Graziano
Blakely Rd.
Colchester, VT 05446

Phone # 655-0811

Colchester School District
Attn: Larry Decker
PO Box 27
Laker Ln.
Colchester, VT 05446

CC: Chris Conant, Claussen's Florist and Greenhouse
Rocco Graziano, Colchester Health Officer
Larry Decker, Colchester School District
Spill File #93-168

TC/tc/wp50/TSS/claussens.cbs

State of Vermont

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
Natural Resources Conservation Council
RELAY SERVICE FOR THE HEARING IMPAIRED
1-800-253-0191 TDD>Voice
1-800-253-0195 Voice>TDD

AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation
Hazardous Materials Management Division
103 South Main Street/West Office
Waterbury, Vermont 05671-0404
(802) 241-3888
FAX (802) 241-3296

November 3, 1994

Chris Conant
Claussen's Florist and Greenhouse
PO Box 2007
Colchester, VT 05449

RE: Petroleum contamination at Claussen's Greenhouse, Colchester, VT
(Site #94-1706)

Dear Mr. Conant:

The Sites Management Section (SMS) has received a report outlining the subsurface assessment for the above referenced site, conducted by Tim Cropley of the Technical Services Section on October 20, 1994. This report, dated October 24, summarizes the degree and extent of contamination encountered during the assessment. A copy of this report has been enclosed for your review. The contamination apparently came from the above ground storage tanks (ASTs) which were stored at the edge of the Claussen's property after having been taken out-of-service. There was reportedly still product in the tanks and it is believed that when the tanks were loaded and removed, material in the tank was spilled and then leached into the ground. It was reported that some soils were removed and stockpiled, but the current status of these soils is unknown.

During the assessment performed by Tim Cropley, soils screened in the area of suspected contamination had peak volatile organic compound concentrations of 80 ppm as measured by a photoionization detector (PID). A clay confining layer is located at approximately 2-2.5 feet below ground surface. Water saturated soils were encountered immediately above the clay layer. No free product was observed. Levels of contamination dropped considerably as the lateral ends of the investigation. Therefore, the degree and extent of soil contamination appears to have been defined. The area affected by the fuel oil at the time of the assessment was approximately 35 feet by 35 feet and stretched onto the Union Memorial School Property.

Based on the above information, the SMS has determined that additional work is necessary at the site in order to protect public health as well as to prevent this contamination from affecting any potential receptors. Therefore, the SMS is requesting that Claussen's Florist and Greenhouse retain the services of a qualified environmental consultant to perform the following:

- Excavate any contaminated soils with PID readings in excess of 10 ppm and stockpile and polyencapsulate these soils in an area such that they have low potential to impact any

nearby sensitive receptors. Also, these soils must be properly sectioned off to prevent public access; the major concern here is children being prevented from playing in these soils. Develop a plan to treat and/or monitor the stockpiled soils. The soils must remain located in an area such that they have a low potential to impact nearby receptors. They must also remain properly encapsulated in plastic. If the soils are to be moved offsite, the SMS or UST Program must grant permission prior to their transport.

Enclosed please find a list of consultants who perform this type of work in the area as well as the brochure "Selecting Your UST Cleanup Contractor", which will help you in choosing an environmental consultant.

If you have any questions, please feel free to call.

Sincerely,

Richard Spiese

Richard Spiese, Acting Supervisor
Sites Management Section

Enclosures
cc: Colchester Selectboard
Rocco Graziano, Colchester Health Officer
Larry Decker, Colchester School District
DEC Regional Office
Spill File #93-168

RS:mm/wp/941706

State of Vermont

AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation
Hazardous Materials Management Division
103 South Main Street/West Office
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Department of Environmental Conservation
State Geologist
Natural Resources Conservation Council
RELAY SERVICE FOR THE HEARING IMPAIRED
1-800-253-0191 TDD>Voice
1-800-253-0195 Voice>TDD

December 12, 1994

Chris Conant
Claussen's Florist and Greenhouse
PO Box 207
Colchester, VT 05449

RE: Time Schedule for Site Cleanup Work at Claussen's Greenhouse, Colchester, VT (Site #94-1706)

Dear Mr. Conant:

The Sites Management Section (SMS) remains concerned about the petroleum contamination which has impacted soils both on Claussen's Florist and Greenhouse property and Union Memorial School property. The SMS still has not received an appropriate response from Claussen's Greenhouse in regards to the work requested in our November 3, 1994 letter; this letter has been enclosed for your review. Based on a phone conversation between us on December 1, it appears that there was some confusion as to a required time frame for the requested work. During our conversation it was determined that Lone Rock Geoscience would be submitting the preliminary cost estimate to you by December 2 and upon its receipt you would forward this information to the SMS. Since the SMS has not yet received any information from your consultant, this letter has been drafted to formally establish a time frame for the work requested in our November 3 letter.

The SMS requests that the work in question be fully implemented and completed within 15 days of your receipt of this letter. Within thirty days, the SMS requests that you submit a brief summary report which describes the work performed as well as provides a treatment and/or monitoring plan for the soils as outlined in our November 3 letter.

Another issue which was raised in our December 1 conversation was financial ability to pay for the work. If you believe that Claussen's Greenhouse may be unable to pay for the requested work, then you must first inform the SMS in writing of Claussen's inability to pay. Included with this notification must be proof of the business's inability to pay. At a minimum this includes, submittal of business tax returns for the last three years as well as a list of business assets; personal tax returns and assets of the business owner may also be submitted. Once this information is received, the SMS makes a determination of the business's ability to pay. An inability to pay determination makes the business eligible for essentially a no interest loan with a mutually acceptable payback schedule.

The SMS looks forward to the completion of this work. If you have any questions, please feel free to call

Sincerely,

Matthew Moran, Site Manager
Sites Management Section

cc: Rocco Graziano, Colchester Health Officer
Larry Decker, Colchester School District

RS:mm/wp/941706-(2)