



November 24, 1993

Mr. Charles B. Schwer  
Petroleum Sites Coordinator  
Vermont Department of  
Environmental Conservation  
103 South Main Street  
Waterbury, VT 05671-0404

RE: Preliminary Site Investigation Results - Merry Meadows Farm, Bradford,  
VT.

Dear Chuck:

Lincoln Applied Geology Inc. (LAG) is pleased to submit the results of the preliminary site investigation conducted at the Merry Meadows Farm (MMF) in Bradford, Vermont. This work was performed in accordance with our work plan that you approved on October 14, 1993. The site is shown on the regional site map presented as **Figure 1**.

A new 1,000 gallon above ground gasoline skid tank is located atop the former 550 gallon gasoline underground storage tank (UST) location. A soil vapor survey conducted with a photoionization detector (PID) in the vicinity of the former UST yielded only background (BG) levels of volatile organic compounds (VOCs) up to a depth of 3 feet below grade. PID screening of subsurface soils removed while hand-augering monitor well AH-1 demonstrated elevated levels of VOCs and a strong 'old' gasoline odor at depths greater than 5.4 feet. PID levels ranged from 80 parts per million (ppm) at 6.1 feet, to 200 ppm at 7.1 feet, to 135 ppm at 8.7 feet, the limit of the hand boring. Ground water sampled from AH-1 contained gasoline related contamination at <300 parts per billion (ppb) total BTEX and 3,670 ppb MTBE.

Due to liability issues, the former 550 gallon gasoline UST was excavated and removed from the site by Northern Petroleum Company (NPC) on August 30, 1993. The UST was found to be in 'fair' condition, and PID levels from soil within the UST excavation peaked at 50 ppm but averaged 8 ppm. No ground water was encountered at the maximum excavation depth of 5 feet. These results were reported on the tank pull form submitted by NPC to the Vermont Department of Environmental Conservation (VDEC).

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In response to the discovery of contaminated soil during excavation of the UST, VDEC required Jack Williams, owner of the MMF, to hire a qualified environmental consultant to conduct additional investigations to define the degree and extent of contamination to soil, ground water, and any potential receptors. This could be accomplished by performing a soil vapor survey, installing ground water monitoring wells, and sampling ground water for the gasoline constituents BTEX and MTBE. Mr. Williams hired LAG in October 1993 to initiate the required activities.

Following your October 14 approval of our work plan, a soil vapor survey was conducted in the vicinity of the former gasoline UST on October 22, 1993. Because the existing 1,000 gallon aboveground gasoline tank is located atop the former UST location, two concentric rings containing 23 vapor points (VPs) were drilled around the tank to a depth of 2.5 to 3 feet. A PID was used to screen the VPs for the presence of VOCs. The PID results indicated that only background (BG) levels of VOCs were detected in the vapor points.

Soil boring AH-1 located 3 feet east of the existing gasoline tank was drilled using hand auger techniques. A maximum depth of 8.7 feet was attained, 3.7 feet deeper than the bottom of the former UST and excavation. Soils removed from the boring were logged descriptively and screened for VOCs using the PID. From the surface to a depth of 4 feet are moist soils consisting of silt with little clay and trace of sand and fine gravel. Ground water was found at 3.9 feet. From 4 to 4.5 feet soils are silt and fine to medium sand with little clay. Below 4.5 feet to a depth of 6.7 feet soils are wet to moist native clay soils. Some mottling is present along with a slight to strong odor of 'old' gasoline within this zone. A unit of dry silt with little fine sand from 6.7 to 7.6 feet containing a strong gasoline odor is underlain by moist clay with little silt from 7.6 feet to 8.2 feet. Moist silts with a trace of clay are found from 8.2 feet to the bottom of the boring at 8.7 feet. The gasoline odor was evident in soils from 5.4 to 8.7 feet. Soils data indicate that ground water encountered at 3.9 feet is perched above the dense, low permeability, underlying clayey soils.

PID screening indicated that soils from AH-1 are contaminated with gasoline below the bottom (5' depth) of the former UST. PID levels increased from 1.2 ppm (4.9- 5.4') to 80 ppm (6.1-6.7') to 200 ppm (7.1-7.4'), and then



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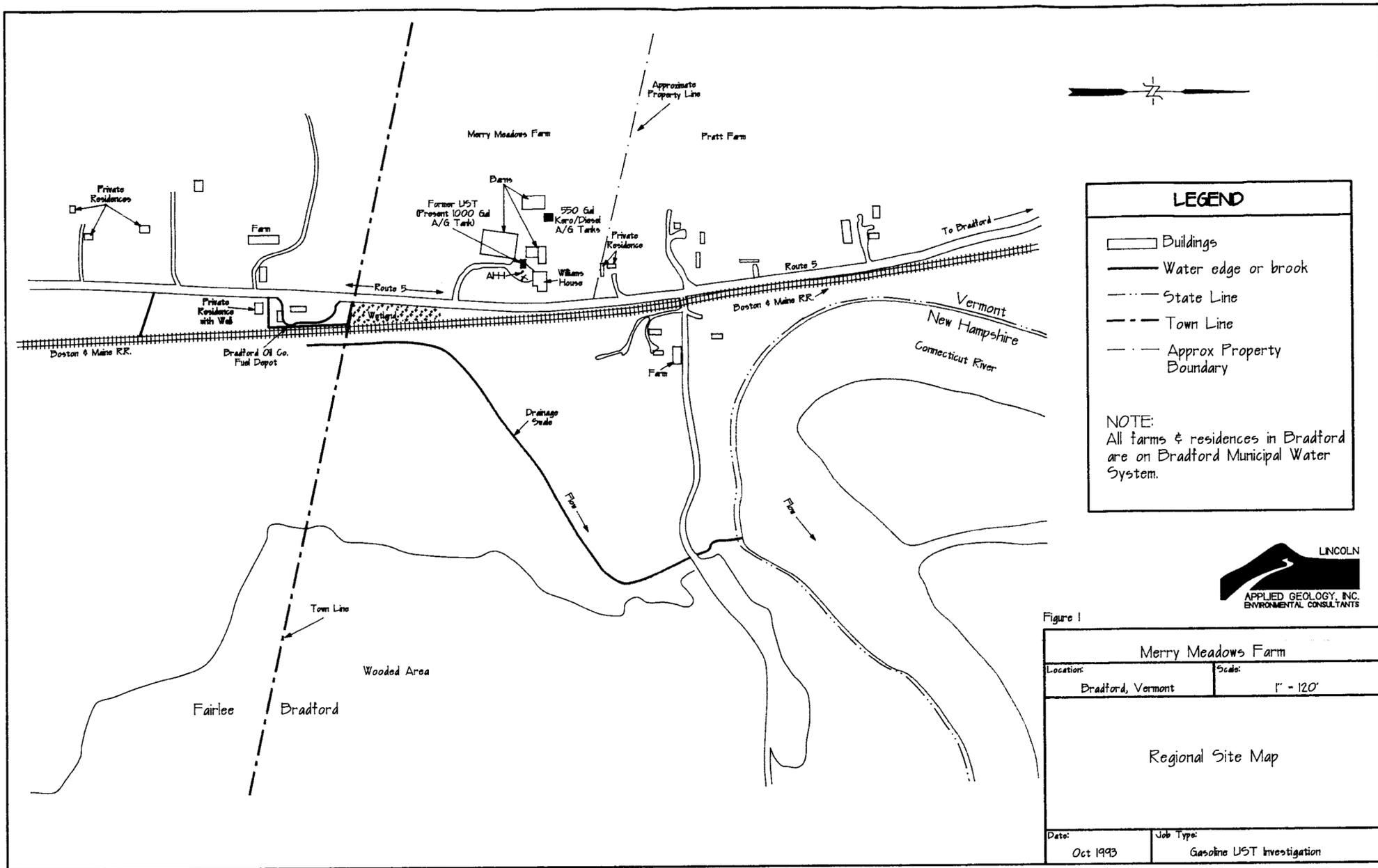
decreased to 130 ppm (8.6- 8.7') at the bottom of the boring. Due to the dense, tight nature of the clay and silt soils, penetration of the hand auger deeper than 8.7 feet was not possible. A 6.4 foot long 2-inch diameter PVC monitoring well consisting of 4 feet of well screen and 2.4 feet of solid riser was then installed in the boring. Collapse of soils from shallower depths prevented deeper placement of the well. Well AH-1 is screened from 3 to 7 feet below grade. A summary of soils descriptions, PID levels, and well construction details is included in the well log included as **Attachment A**.

A sample of the perched ground water was collected following well installation and proper purging of the well. The sample was delivered along with a trip blank and proper chain-of-custody form to the MicroAssays of Vermont (MAV) laboratory in Middlesex for BTEX and MTBE analysis. Analytical results of the AH-1 sample indicate that ground water contains <300 ppb total BTEX and 3,670 ppb MTBE. The MAV analytical reports are included as **Attachment B**.

Results of the receptor survey indicate that drinking water for the MMF and other private residences and farms in the Town of Bradford to the north and east along Route 5 is supplied by the Bradford municipal water system. To the south and southeast along Route 5 in the Town of Fairlee, drinking water to private residences and farms is supplied by on-site wells and springs. A surface water wetland area is located southeast of the MMF between Route 5 and the Boston and Maine Railroad (BMRR) as shown on **Figure 1**. A drainage swale on the east side of the BMRR conveys drainage water north-northeast into the Connecticut River, about 400 feet northeast of MMF. Bradford Oil Company owns and maintains a bulk fuel oil and propane cylinder storage depot on the west side of the BMRR south of the wetland area. No visible sheens or petroleum odors were observed in the wetlands area, or on surface water in the drainage swale. Finally, there appears to be no apparent vapor impacts to the MMF residence basement.

The investigation conducted by LAG at the MMF site indicates there is some gasoline related contamination of subsurface soils and ground water in the area of the former UST as detected by visual and olfactory senses, the PID, and water quality laboratory analysis. The receptor survey indicates that the MMF and other private residences and farms to the north and east obtain drinking water from the Town of Bradford municipal water system. Private





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homes and farms to the south obtain drinking water from on-site wells and springs.

Based on these observations and findings, one additional ground water monitoring well (MW-1) should be drilled and installed on the MMF property to aid with determining the extent of soil and ground water contamination emanating from the former UST. This well will be installed about 5 feet east of the former UST. This well will be installed using a truck mounted drilling rig with hollow stem augers. While drilling, soils will be sampled continuously from the surface to the bottom of the boring using a split barrel sampler. The soils will be logged descriptively and screened for VOCs using a PID. Following installation, the well will be properly developed, and a location and elevation survey conducted to determine the locations of pertinent on-site features and AH-1, and the elevations of the well top of casings (TOCs). Shortly thereafter, a full ground water elevation and PID monitoring survey will be conducted, and ground water samples will be collected from AH-1 and MW-1, and analyzed along with a trip blank for the gasoline constituents BTEX and MTBE. An estimated cost proposal for the proposed work is included in **Attachment C**.

If you have any questions or comments regarding this investigation, please contact me or John Amadon, LAG Project Manager, at 453-4384. We look forward to resolving this gasoline contamination problem as expeditiously as possible.

Sincerely,



William D. Norland  
Hydrogeologist

WDN/tasp  
Enclosures  
cc: Jack Williams



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# ATTACHMENT A

AH-1 Well Log

## WELL LOG

WELL: AH-1

LOCATION: Merry Meadows Farm, Route 5, Bradford, VT. At location of former gasoline UST.

DRILLER: Lincoln Applied Geology, Inc. - hand augered boring.

HYDROGEOLOGIST: William Norland, Lincoln Applied Geology, Inc.

DATE: October 22, 1993

### Soils Description

Background = BG = 0.2 ppm

<u>Depth</u>	<u>Description</u>	<u>PID (ppm)</u>
0-2'	Moist, olive and brown, <u>silt</u> ; little clay; trace of fine to medium sand.	
2-3'	Moist, olive and brown, <u>silt</u> ; little clay; trace of fine to medium sand, fine gravel	BG (0-4.5')
3-4'	Moist to wet, olive and brown, <u>silt</u> ; little fine sand, clay; trace of fine gravel. Ground water at 3.9'.	
4-4.5'	Wet, olive gray and brown, <u>silt and fine to medium sand</u> ; little clay; trace of coarse sand.	
4.5-5.1'	Wet, olive gray, <u>clay</u> ; some silt. Dark brown staining on fracture surface.	0.1 (4.5-4.9')
5.1-5.4'	Moist, very dense, olive green, <u>clay</u> ; some silt.	1.2 (4.9-5.4')
5.4-6.7'	Moist, very dense, olive green, <u>clay</u> ; some silt.	5.0 (5.4-5.8')
	Brown mottles, slight odor of 'old' gasoline.	5.6 (5.8-6.1')
	Strong odor of 'old' gasoline 6.1-6.7'	80 (6.1-6.7')

6.7-7.6'	Dry, tan, <u>silt</u> ; little very fine sand. Strong odor of 'old' gasoline.	164 (6.7-7.1')
7.6-7.8'	Moist, dense, olive green, <u>clay</u> ; little to trace of silt.	200 (7.1-7.4')
7.8-8.2'	Moist, olive green to olive tan, <u>clay</u> ; some silt.	176 (7.8-8.2')
8.2-8.6'	Moist, olive tan, <u>silt</u> ; little to trace of clay.	135 (8.2-8.6')
8.6-8.7'	Moist, olive tan, <u>silt</u> ; little to trace of clay.	130 (8.6-8.7')

Cannot penetrate deeper with hand augers.  
Install well.

### Well Construction

Bottom of Boring: 8.7'

Well Screen: (4.0') 3.0'-7.0'; 2" PVC, sch.40, 0.020" slot

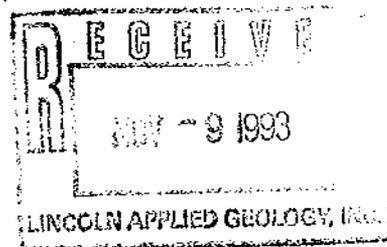
Solid Riser: (2.4') 0.6'-3.0'; 2" PVC, sch.40

Sand Pack: none

Bentonite Seal: none

Backfill: Native clay seal packed around riser

**ATTACHMENT B**  
**MicroAssays Laboratory Report**



## LABORATORY ANALYSIS

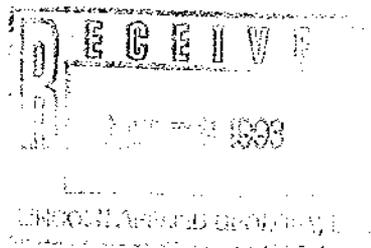
CLIENT NAME:	Lincoln Applied Geology	MAV CONTROL NO.:	7588
ADDRESS:	RD #1 Box 710 Bristol, VT 05443	PROJECT NO.:	Not Given
SAMPLE LOCATION:	Merry Meadow	DATE OF SAMPLE:	10/22/93
SAMPLER:	Jim Holman & Bill Norland	DATE OF RECEIPT:	10/22/93
		DATE OF ANALYSIS:	11/3,11/4/93
ATTENTION:	John Amadon	DATE OF REPORT:	11/5/93

Pertaining to the analyses of specimens submitted under the accompanying chain of custody form, please note the following:

- Samples were preserved with HCl.
- Specimens were processed and examined according to the procedures outlined in the specified method.
- Holding times were honored.
- Instruments were appropriately tuned and calibrations were checked with the frequencies required in the specified method.
- Blank contamination was not observed at levels interfering with the analytical results.
- Matrix spikes, matrix spike duplicates, and continuing calibration standards were monitored at intervals indicated in the specified method. The resulting analytical precision and accuracy were recorded and determined to be within method QA/QC acceptance limits.
- The inferred efficiency of analyte recovery for individual samples was monitored by the addition of surrogate analytes to all samples, standards, and blanks. Surrogate recoveries were found to be within laboratory QA/QC acceptance limits, unless noted otherwise.

Reviewed by:

Brendan McMahon, Ph.D.  
Director, Chemical Services



## LABORATORY REPORT

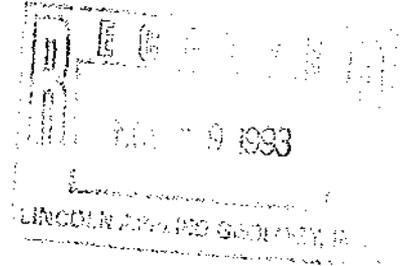
### GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	Not Given
PROJECT NAME:	Merry Meadow	REF.#:	7588
REPORT DATE:	November 5, 1993	STATION:	Trip Blank
DATE SAMPLED:	October 22, 1993	TIME SAMPLED:	08:00
DATE RECEIVED:	October 22, 1993	SAMPLER:	Jim Holman
ANALYSIS DATE:	November 4, 1993		

PARAMETER	PQL ( $\mu\text{g/L}$ )	Concentration ( $\mu\text{g/L}$ )
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 99%

BPQL = Below Practical Quantitation Limit (PQL).



## LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	Not Given
PROJECT NAME:	Merry Meadow	REF.#:	7588
REPORT DATE:	November 5, 1993	STATION:	AH-1
DATE SAMPLED:	October 22, 1993	TIME SAMPLED:	14:00
DATE RECEIVED:	October 22, 1993	SAMPLER:	Jim Holman
ANALYSIS DATE:	November 4, 1993		

PARAMETER	PQL ( $\mu\text{g/L}$ )	Concentration ( $\mu\text{g/L}$ )
Benzene	50	BPQL
Toluene	50	BPQL
Ethylbenzene	50	BPQL
Xylenes	150	BPQL
MTBE	50	3670

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).



**ATTACHMENT C**

**Cost Estimates**

**MERRY MEADOWS FARM  
COST ESTIMATE  
NOVEMBER 1993**

**A. Monitor Well Installation**

Drillers Charges **\$1,345.00**

**B. Drilling Supervision**

Hydrogeologist 10 hrs. @ \$45/hr 450.00  
Mileage 300 miles @ \$.30/mile 90.00  
PID & Interface Probe @ \$100/day 100.00  
Metal Detector @ \$30/day 30.00

**Subtotal \$ 670.00**

**C. Ground Water Sampling**

Technician 6 hrs. @ \$30/hr \$ 180.00  
Mileage 300 @ \$.30/mile 90.00  
Pump & Generator @ \$110/day 110.00  
3 Disposable Bailers @ \$6.70 20.10  
Lab Analyses 3 samples + trip blank @\$58 232.00

**Subtotal \$ 632.10**

**D. Summary Report**

Project Manager 2 hrs. @ \$50/hr \$ 100.00  
Hydrogeologist 10 hrs. @ \$45/hr \$ 450.00  
Computer Tech. 7 hrs. @ \$30/hr \$ 210.00  
Administrative Assistant 6 hrs. @ \$30/hr \$ 180.00

**Subtotal \$1,572.10**

**Total A,B,C,D \$4,219.20**



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