



TWIN STATE ENVIRONMENTAL CORP.

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Phase (check one)	Type (check one)
<input checked="" type="checkbox"/> Site Investigation	<input type="checkbox"/> Work Scope
<input checked="" type="checkbox"/> Corrective Action Feasibility Investigation	<input type="checkbox"/> Technical Report
<input checked="" type="checkbox"/> Corrective Action Plan	<input type="checkbox"/> PCF Reimbursement Request
<input checked="" type="checkbox"/> Corrective Action Summary Report	<input type="checkbox"/> General Correspondence
<input checked="" type="checkbox"/> Operations & Monitoring Report	

SITE INVESTIGATION REPORT JULY 23, 1996

Richmond Town Highway Garage
Richmond, Vermont 05477

207.1

SMS Site # N/A
UST Facility # N/A
TSE/C #96-057

Facility Owned By:

Town of Richmond
Highway Department
Richmond, Vermont

Written By:

Jon P. Berntsen
Staff Geologist

Reviewed By:

John R. Diego
Vice President

July 23, 1996

Mr. Ron Rodjenski
Richmond Town Administrator
Town of Richmond
P.O. Box 285
Richmond, VT 05477

**RE: Site Investigation
Richmond Town Highway Garage
Richmond, Vermont
TSEC Project No. 96-057**

Dear Mr. Rodjenski:

Enclosed is the Site Investigation Report that was prepared to further evaluate subsurface petroleum contamination resulting from underground storage tanks that have been removed from the SITE. This work was carried out using the "Site Investigation Expressway Notification" due to forthcoming construction activities planned at the SITE.

Our investigation has identified gasoline and diesel-related contamination that has impacted soil and groundwater on SITE. It has been discovered that groundwater and soil contamination follows the more permeable fill sediments in the former tank excavation and along the building foundation.

We have recommended that heavily contaminated soils be excavated for subsequent disposal or stockpiling. Additionally, air quality monitoring should be conducted during the excavation and completion of the footings and foundation for the new garage facility. Please be advised that construction activities for subsurface construction work may require a minimum of 24 hours of OSHA training for general site workers

Please call to discuss our findings or other matters of concern.

Very truly yours,
TWIN STATE ENVIRONMENTAL CORPORATION

Jon P. Berntsen
Staff Geologist

encl.

cc: Mr. Chuck Schwer, State of Vermont, Sites Management Section
jpb:\project\96057\ust\report.doc

1.0 INTRODUCTION

This report has been prepared by Twin State Environmental Corporation (TSEC) under agreement with the SITE owner, the Town of Richmond, Vermont, to present the findings of a recent investigation at the Richmond Town Highway Garage (SITE) (see SITE Location Map, **Figure 1**).

Observations made during the recent removal of two (2) underground storage tanks (USTs) at the SITE revealed the presence of gasoline and diesel contamination in the soil and groundwater. A series of soil borings were installed, and soil and groundwater samples were taken to investigate the extent of this subsurface petroleum-related contamination. Petroleum releases from the former USTs have impacted an area in the northeastern portion of the SITE, as well as soils surrounding the building footings.

Based upon the contaminant distribution and local hydrogeological conditions, considering the data generated to date, it appears that the leading edge of the contaminant plume has remained on SITE. Concentrations of total BTEX in the soil and groundwater in the immediate vicinity of the former USTs exceeds maximum contaminant levels (MCLs).

The town is currently seeking bids for demolition of the existing structure and construction of a new facility. The presence of contaminated soils will be a factor during contractor selection.

2.0 SCOPE OF SERVICES

The following scope of services were performed by TSEC during this investigation:

- A subsurface investigation was performed that included the advancement of eighteen (18) soil borings and installation of two (2) temporary groundwater monitoring wells. Geoprobe™ sampling was performed and soil samples were field screened using a Thermo Environmental Instruments Organic Vapor Meter (OVM) photoionization detector for volatile organic compounds (VOCs) and selected samples were analyzed for total BTEX and total volatile organic compounds (TVPH) via a modified EPA Method 3810 using a Photovac field gas chromatograph.

Proposed monitor well construction will be delayed until after completion of below grade site work.

- Five (5) shallow soil samples were collected on the northwestern portion of the site and field screened for VOCs using an OVM.

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- A groundwater sample was collected from one temporary monitoring well and tested for total BTEX and TVPH via a modified EPA Method 3810.
- Soil was characterized in the area where new building construction will take place.
- Identify potential receptors and Well Head Protection Areas (WHPA)
- Prepare a summary report of the above-mentioned scope of work.

3.0 SITE LOCATION AND DESCRIPTION

SITE Owner: Town of Richmond, Vermont
Address: Thompson Road (tax map #7, lots #17.13 and #20)
Richmond, Vermont
Size: 0.96 acres
Zoning: Residential/Agriculture
Utilities: Water - municipal connection,
Sewer - municipal connection,
Electricity - overhead connection
Structures: One (1) one-story cinder block garage, one (1) salt storage shed,
and one (1) miscellaneous storage building.

The SITE is located on the western side of Thompson Road in Richmond, Vermont (see SITE Location Map, **Figure 1**). There are three (3) buildings on SITE which consist of a garage/maintenance building that was initially constructed in 1952, and two more recently constructed storage sheds; one shed for storage of road salt, one shed for the storage of miscellaneous materials. Past renovations have included expansion of the garage building to the north, and removal of old USTs (see SITE Plan, **Figure 2**). Future plans call for the demolition of the existing garage and construction of a new structure, scheduled to begin in the summer of 1996.

The SITE is in a residentially and agriculturally zoned area situated in a mixed land use area. The SITE is abutted to the north and south and east by residential properties, and to the west by a field.

Two (2) USTs were recently removed from the SITE and were used for the storage of diesel fuel and waste oil. Two (2) additional USTs were removed from the site in the mid-1980's and were used for the storage of gasoline and kerosene. The two recently removed tanks consisted of one (1) 275-gal waste oil UST located along the western edge of the garage building, and one (1) 1,000-gal diesel UST located adjacent to the north wall of the garage. The former gasoline and kerosene USTs (size unknown) were also located adjacent to the north wall of the garage (see SITE Plan, **Figure 2**).

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The SITE gently slopes from west to east becoming flat on the eastern half of the property. The regional topography slopes gently northward. There is a small drainage ditch into which site run-off is directed on the northern edge of the property. This feature is then culverted beneath Thompson Road into a larger drainage feature.

4.0 UST CLOSURES ON SITE

Two (2) USTs were removed during July 1996 under the direction of TSEC. On July 10, 1996, one (1) 275-gal waste oil UST and one (1) 1,000-gal diesel fuel UST were excavated and removed. The waste oil tank was completely corroded at both bottom ends of the tank, and the diesel tank exhibited exterior surficial pitting (<1/8 inch deep). Field screening of the surrounding soils indicated VOC concentrations to a maximum of 234 parts per million volume (ppmv) in the vicinity of the diesel UST, and no OVM readings were encountered in the vicinity of the waste oil UST. Groundwater contamination was also observed in the diesel tank excavation.

In the mid-1980's, one (1) gasoline UST, and one (1) kerosene UST were removed from the SITE. Although four (4) groundwater monitoring wells were installed, no additional work was performed.

5.0 SUBSURFACE EXPLORATION AND RESULTS

The subsurface exploration program was developed to gather data to provide a better understanding of the hydrogeology and contaminant distribution on SITE.

5.1 Soil Boring Installation

Eighteen (18) soil borings were installed on July 11, 1996 by TSEC. The borings were installed in the following locations as depicted on the Boring Location Plan, **Figure 3**.

- Soil Borings A-1, C-1, C-4, C-8, C-9, E-1, E-4, E-8, F-4, AA-11, and BB-9 were installed in the vicinity of the recently removed 1,000 gallon diesel UST, and the former gasoline and kerosene USTs, adjacent to the northern wall of the garage;
- borings GP-1 and GP-2 were installed between the former gasoline UST and Thompson Road;
- borings GP-3 and GP-4 were installed in and adjacent to the former waste oil UST excavation;
- boring GP-5 was installed in front of the northern bay door along the garage foundation; and,
- borings GP-6 and GP-7 were installed along the east side of the building, along the foundation footings.

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Temporary wells were installed in borings A-1 and C-4. The wells were constructed of 1-inch, schedule 40 polyvinylchloride (PVC) riser with 0.010-inch machine slotted screen. The wells were of a temporary nature, and as such, no filter sand pack or bentonite seal was placed in the annular space of the borehole. After a water level measurement was taken, and a groundwater sample collected, the PVC was removed, and the boring was backfilled with bentonite.

Further details of the monitoring well installation are presented on boring logs, presented in **Appendix A**.

5.1.1 SITE Geology

A summary of the predominate geological units encountered, as observed from Geoprobe™ sampling is provided in Boring Logs, **Appendix A**.

According to the U.S. Department of Agriculture Soil Conservation Service, soils in the vicinity of the SITE are part of the Munson Series. The Munson Series consists of deep, poorly drained soils on gentle to moderately steep slopes. They formed in thin deposits of loamy material and in the underlying clayey material. Typically these soils have a very brown silt loam surface layer about 8 inches thick. The upper portion of the subsoil, from 8 to 15 inches, is a friable, grayish-brown and olive silt loam that is mottled. The lower subsoil, from 15 to 24 inches, is a firm, olive-brown to greenish-gray silty clay loam and silty clay. The substratum from 24 to 56 inches is a brown to greenish-gray silty clay. Slopes range from 2 to 25 percent. Generally the water table is encountered one (1) to three (3) feet below ground surface (ft bgs).

5.1.2 Geoprobe™ Sampling

Geoprobe™ soil samples were field screened using a Thermo Environmental Instruments Organic Vapor Meter (OVM) with a 10.6 eV photoionization detector to detect the presence of VOCs. Data collected during field screening are summarized in **Table 1** (Headspace Field Screening Summary).

The highest VOC concentration detected by the OVM (523 ppmv) was found at boring C-4 at a depth of 4 to 8 ft bgs. Boring C-4 is located in the former backfilled gasoline UST excavation on the northeastern portion of the SITE.

5.2 Shallow Soil Sample Collection

On July 12, 1996, five (5) shallow soil samples were collected by TSEC and field screened for VOCs using an OVM. All samples were collected from a "dump area" located in the northeast corner of the property (see SITE Plan, **Figure 2**), where significant soil staining and fuel oil odors were present. Concentrations reported by the OVM in samples collected ranged from 33 ppmv to 180 ppmv. Data collected during field screening are summarized in **Table 1** (Headspace Field Screening Summary).

6.0 GROUNDWATER SAMPLING ACTIVITIES

One groundwater sample was collected by TSEC on July 11, 1996, from the temporary well installed at soil boring C-4. The approximate depth at which groundwater occurs beneath the site was also noted.

6.1 Water Table Elevation Data

The depth to groundwater in two (2) temporary wells was measured with a hand held measuring tape. At boring C-4, the water table was encountered at approximately 3.2 feet bgs. The water table at boring A-1 was encountered at approximately 2.2 feet bgs.

6.2 Groundwater Sampling

A groundwater sample was collected from the temporary well installed at boring C-4. The groundwater sample was collected from the temporary monitoring well using a disposable ½-inch polyethylene bailer.

7.0 RESULTS OF SAMPLING ACTIVITIES

7.1 Water Table Elevation and Flow Direction

As was previously mentioned, current depth to water levels were found to be approximately 2.2 ft bgs and 3.2 ft bgs at borings A-1 and C-4, respectively.

The temporary wells were not surveyed for elevation, hence an exact direction of groundwater flow can not be calculated. However, based on site topography and surface drainage, it can be inferred that groundwater flows in a north-northeast direction across the site, as illustrated in **Figure 4**.

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7.2 Analytical Results

The current soil and groundwater sampling results are summarized in **Table 2** (Field Chemistry Report); an OVM Isopleth Map depicting our interpretation of the current extent of petroleum contamination in soil is presented as **Figure 5**. This figure was generated with data collected using a jar headspace method to liberate VOCs from the soil to the vapor phase. This data illustrates a similar contaminant distribution to that of the BTEX and TVPH analyses.

The area of the SITE with the highest concentrations of total BTEX and TVPH in soil is located in the northeastern corner of the property near the former gasoline, kerosene, and diesel USTs, as is the area that exhibits the highest concentrations of TVPH. This area also extends along the garage foundation and footings to at least the location of boring GP-5, and coincides with the area depicted in **Figure 5**.

The maximum concentration of total BTEX present in soil, 111,500 parts per billion (ppb), and the maximum concentration of TVPH present in soil, 2,473,450 ppb, were both found in the sample collected from boring C-4, at a depth interval of 4 to 8 ft bgs.

Samples collected from borings A-1, E-1, BB-9, GP-3, and GP-4 contained no detectable BTEX or TVPH compounds. Additionally, the sample collected from boring C-1 contained no detectable TVPH concentrations. All other samples contained BTEX at concentrations ranging from 10.4 ppb to 111,500 ppb and TVPH at concentrations ranging from 32 ppb to 2,473,450 ppb.

8.0 POTENTIAL RECEPTORS AND WELLHEAD PROTECTION AREAS

8.1 Potential Receptors

A search and review of records at the State of Vermont Department of Water Resources indicates that there are two private wells in the immediate vicinity of the SITE, and the town supply well is located approximately ½-mile downgradient of the SITE. However, a search for the individual well completion records was not successful.

There are several surface water features that may potentially be affected by offsite migration of contaminants. These include a small drainage that intercepts surface water from the SITE as well as a feature that feeds the Winooski River.

8.2 Well Head Protection Areas

The Town of Richmond operates water production wells to supply its customers. The well nearest to the town garage facility is located on Bridge Street, in the alluvial deposits

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along the Winooski River. According to the Richmond Water and Sewer Department, the well, approximately ½-mile from the garage SITE, is completed in the overburden to a depth of 35 feet, and is rated to operate at 800 gallons per minute (gpm). Currently, the well is only operating at 250 gpm to serve the towns water supply requirements.

Due to the wells proximity to the Winooski River and its total completion depth, it can be assumed that the majority of the water entering the well is originating from the alluvial aquifer deposits surrounding the well and the river. Taking into account the low permeability of the deposits found beneath the garage SITE, combined with the distance to the town well, it is unlikely that contamination originating from the SITE will influence the water quality of the town well.

9.0 SUMMARY AND CONCLUSIONS

Based upon information and analytical data collected during this scope of work, TSEC concludes the following:

- From conditions identified to date, the likely source of contamination that exists on SITE is related to the former gasoline UST on the northern portion of the SITE. Both field observations and laboratory data suggested that the soil and groundwater has been impacted by gasoline and diesel-related hydrocarbons.
- Eighteen (18) soil borings were installed on SITE using a Geoprobe™, and two (2) temporary wells were installed in an attempt to characterize groundwater and soil contamination present on SITE. VOCs were detected in soil samples collected from thirteen (13) borings, and TVPH was detected in samples collected from twelve (12) borings.

Field screening of Geoprobe™ samples indicated the highest levels of VOCs at boring C-4 in the former gasoline and kerosene tank cavity. Presently, no information is available concerning the condition of the former tanks or the extent of soil contamination present during their removal. The sandy fill material encountered at the location of boring C-4 is not consistent with the compact clayey silt that is found beneath the remainder of the site. This may cause groundwater, which has been contaminated by releases from the former gasoline UST, to concentrate in this area.

- Groundwater flow direction across the SITE under normal conditions is assumed to be flowing to the north-northeast. An inferred Groundwater Contour Map is presented as **Figure 4**.

It is important to note that the groundwater will flow along the path of least resistance. In the case of the area occupied by the town garage, the native materials (silts and

clays) will inhibit groundwater flow. The preferred path of travel would be through the more permeable backfill materials that surround the building foundation and footings, UST excavations, and underground utility conduits. As a result, contamination is more likely to be present in these areas, and the path of off-site migration is limited to subsurface utility conduits.

- Soil contamination extends along the garage foundation and footings to the east side of the of the building. It appears that the contamination has migrated through the more coarse sandy fill material found around the foundation and footings. Additionally, the potential exists for contamination to be present under the foundation, especially if the groundwater level has dropped below the bottom of the footings.
- Groundwater contaminated by contents released from the waste oil UST has most likely traveled along the building foundation and into the area of the former gasoline, kerosene, and diesel USTs.
- The source area for the soil and groundwater contamination present on SITE is the former gasoline, kerosene, and diesel UST cavity.
- Contamination originating from the SITE should have no apparent adverse effect on water quality of the town production well on Bridge Street.

10.0 RECOMMENDATIONS

Based upon current SITE conditions, TSEC offers the following professional recommendations.

- During construction, particularly during excavation for the footings and foundation, VOC concentrations in air should be monitored.
- Workers involved in the construction of the new garage facility should be OSHA certified, in accordance with 29 CFR 1910.120 regulations.
- After completion of below grade construction for the new garage facility, several monitor wells should be installed, at locations shown on **Figure 6**.
- Some effort should be made to clean up the dump area in the northwestern portion of the site. Additionally, dumping activities should cease.
- Several deeper borings should be conducted in the dump area to attempt to quantify the amount and type of contamination present.

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- Contaminated soil in the area of the former gasoline and kerosene tanks should be excavated for subsequent disposal or stockpiling. A suitable offsite location for stockpiling of soil should be sought in accordance with the Vermont Agency of Natural Resources Guidelines for Handling Petroleum Contaminated Soil and Carbon Media, Section III B or; material should be transported to a licensed disposal or recycling facility.
- Upon receipt of full laboratory analytical data of samples collected in and adjacent to the former waste oil UST, a recommendation can be made whether or not to excavate potentially contaminated soil.

TABLES

TABLE 1
HEADSPACE FIELD SCREENING SUMMARY

Richmond Town Garage
Richmond, Vermont

July 10 thru 12, 1996

Sample ID	GP-1	GP-1	GP-2	A-1	A-1	C-1	C-1
Sample Interval (ft)	0-4	4-8	0-4	0-4	4-8	0-4	4-8
PID (ppmv)	34	0	0	0	0	0	0

Sample ID	E-1	E-1	E-1	E-4	E-4	E-8	E-8
Sample Interval (ft)	0-4	4-8	8-12	0-4	4-8	0-4	4-8
PID (ppmv)	0	0	0	4	9	0	0

Sample ID	C-8	C-8	C-8	C-8	AA-11	AA-11	C-4
Sample Interval (ft)	0-4	4-8	8-12	0-4	0-4	4-8	0-4
PID (ppmv)	518	466	0	14	0	0	493

Sample ID	C-4	F-4	BB-9	GP-3	GP-3	GP-4	GP-4
Sample Interval (ft)	4-8	0-4	0-4	0-4	4-8	0-4	4-8
PID (ppmv)	523	0	0	0	1.6	0	2

Sample ID	GP-5	GP-5	GP-6	GP-7	GP-7	DA-1	DA-2
Sample Interval (ft)	0-4	4-8	0-4	0-4	4-8	0-1	0-1
PID (ppmv)	235	43	0	41	173	33	68

Sample ID	DA-3	DA-4	DA-5				
Sample Interval (ft)	0-1	0-1	0-1				
PID (ppmv)	81.7	180	122				

Notes:

1. Samples collected using Geoprobe. See Figure 3 for locations.
2. PID - Field screening levels using a ThermoEnvironmental Instruments photoionization detector calibrated with an isobutylene standard.
3. Samples DA-1 thru DA-5 were collected in the "Dump Area" in the northwest corner of the SITE.

**TABLE 2
FIELD CHEMISTRY REPORT**

Richmond Town Garage
Richmond, Vermont

Sample ID		Blank	A-1	A-1	E-1	C-1	C-8
Sample Depth (ft)		-	4.0	6.0	8.0 - 9.0	4.0	12.0
Matrix		soil	soil	soil	soil	soil	soil
Date Sampled		07/11/96	07/11/96	07/11/96	07/11/96	07/11/96	07/11/96
Date Analyzed		07/11/96	07/11/96	07/11/96	07/11/96	07/11/96	07/11/96
Analyte	Detection Limit (ug/kg)	Sample Concentration (ug/kg)					
Benzene	2	<2	<2	<2	<2	<2	418
Toluene	2	<2	<2	<2	<2	10.4	1,020
Ethylbenzene	4	<4	<4	<4	<4	<4	57
Total Xylenes	4	<4	<4	<4	<4	<4	246
Total BTEX	-	-	-	-	-	10.4	1,741
PID (ppmv)	0.1	-	<0.1	<0.1	<0.1	<0.1	466
TVPH (ug/kg)	4	<4	<4	<4	<4	<4	25,030
DLM		1	1	1	1	1	4
Soil weight (g)		-	11.9	10.7	11.5	12.1	10.0

Sample ID		E-4	BB-9	AA-11	C-9	C-4 (*)	GP-3
Sample Depth (ft)		8.0	3.0	0 - 4.0	3.5 - 4.0	4.0	5.0
Matrix		soil	soil	soil	soil	soil	soil
Date Sampled		07/11/96	07/11/96	07/11/96	07/11/96	07/11/96	07/11/96
Date Analyzed		07/11/96	07/11/96	07/11/96	07/11/96	07/11/96	07/11/96
Analyte	Detection Limit (ug/kg)	Sample Concentration (ug/kg)					
Benzene	2	22	<2	<2	325	8,070	<2
Toluene	2	33	<2	<2	900	37,720	<2
Ethylbenzene	4	9.9	<4	7.4	<420	7,640	<4
Total Xylenes	4	21	<4	28	7,650	58,120	<4
Total BTEX	-	86	-	35	8,875	111,550	-
PID (ppmv)	0.1	9	<0.1	<0.1	14	493	2
TVPH (ug/kg)	4	560	<4	92	24,530	2,473,450	32
DLM		2	1	1	44	88/880	1
Soil weight (g)		11.5	9.1	7.6	4.2	2.4/5.1	12.5

Notes:

1. DLM - detection limit multiplier. This number represents a dilution factor which is calculated in the sample concentration when a dilution is necessary.
2. Soil weight is based on a wet weight value.
3. PID - Field screening levels using a ThermoEnvironmental Instruments photoionization detector calibrated with an isobutylene standard.
4. TVPH - Total volatile petroleum hydrocarbons, based on average response of xylene isomers.
5. * - Benzene and toluene calculated with an 880X dilution and soil weight of 5.1 g. Ethylbenzene, xylenes and TVPH calculated with an 88X dilution and soil weight of 2.4 g.

**TABLE 2
FIELD CHEMISTRY REPORT**

Richmond Town Garage
Richmond, Vermont

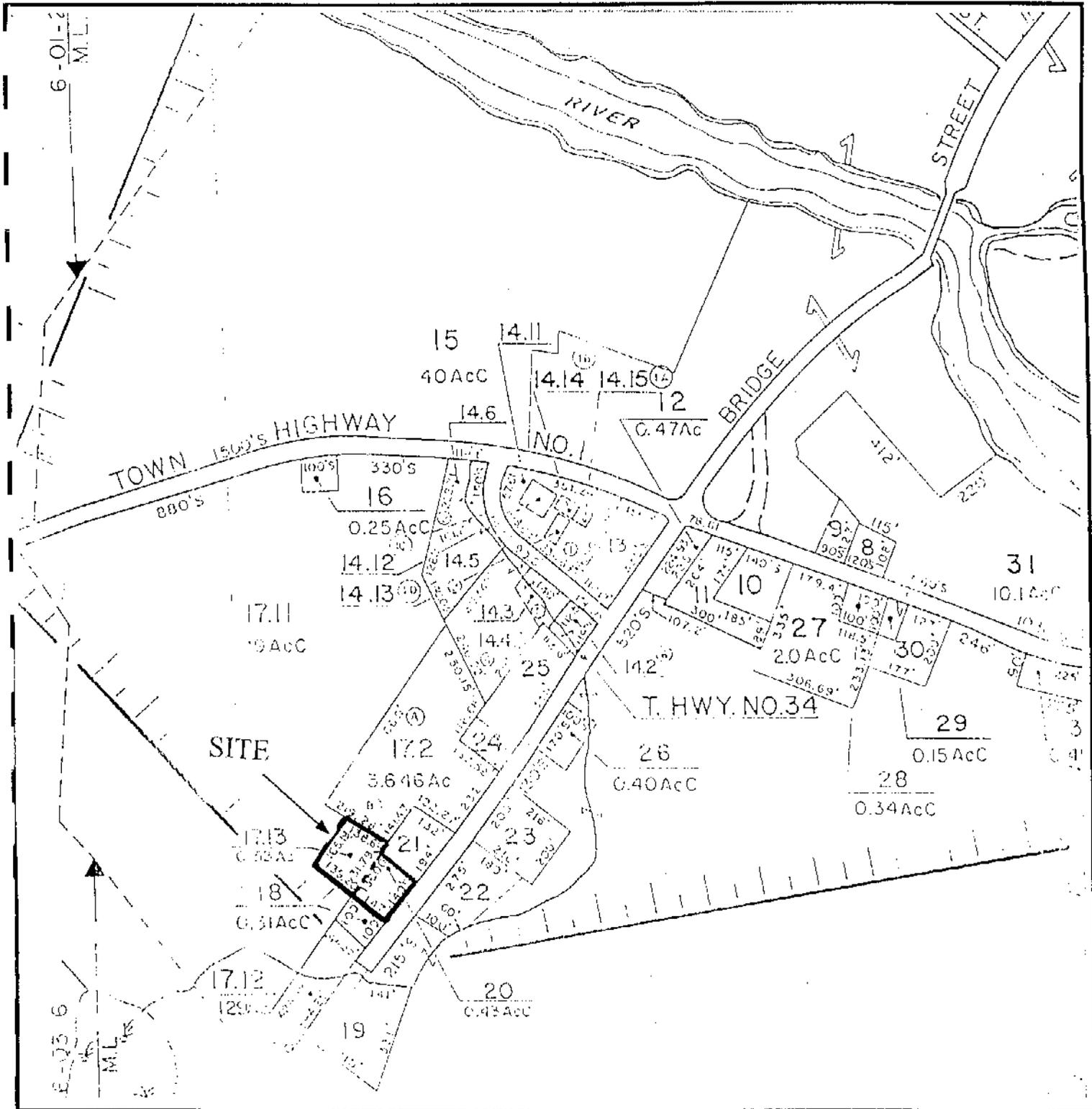
Sample ID		GP-4	GP-4	GP-5	GP-7		
Sample Depth (ft)		3.5	8.0	5.0	3.5		
Matrix		soil	soil	soil	soil		
Date Sampled		07/11/96	07/11/96	07/11/96	07/11/96		
Date Analyzed		07/11/96	07/11/96	07/11/96	07/11/96		
Analyte	Detection Limit (ug/kg)	Sample Concentration (ug/kg)					
Benzene	2	<2	<2	<110	<120		
Toluene	2	<2	<2	<110	<120		
Ethylbenzene	4	<4	<4	<210	<230		
Total Xylenes	4	<4	<4	800	1,710		
Total BTEX	-	-	-	800	1,710		
PID (ppmv)	0.1	<0.1	<0.1	235	173		
TVPH (ug/kg)	4	<4	<4	5,640	9,940		
DLM		1	1	44	44		
Soil weight (g)		10.3	9.7	8.3	7.6		

Sample ID		C-4					
Sample Depth (ft)		-					
Matrix		water					
Date Sampled		07/11/96					
Date Analyzed		07/11/96					
Analyte	Detection Limit (ug/L)	Sample Concentration (ug/L)					
Benzene	1	883					
Toluene	1	13,438					
Ethylbenzene	2	1,787					
Total Xylenes	2	12,257					
Total BTEX	-	28,365					
PID (ppmv)	-	-					
TVPH (ug/kg)	2	82,363					
DLM		300					
Soil weight (g)		-					

Notes:

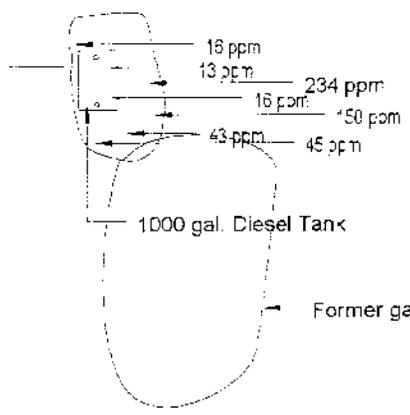
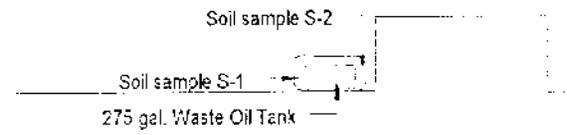
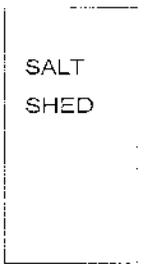
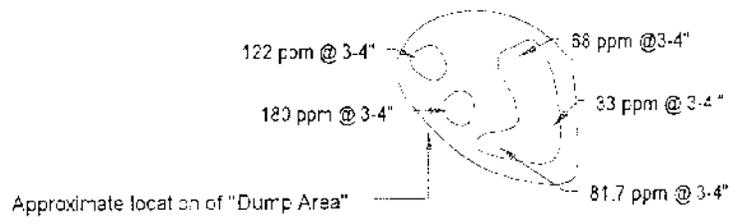
1. DLM - detection limit multiplier. This number represents a dilution factor which is calculated in the sample concentration when a dilution is necessary
2. Soil weight is based on a wet weight value.
3. PID - Field screening levels using a ThermoEnvironmental Instruments photoionization detector calibrated with an isobutylene standard.
4. TVPH - Total volatile petroleum hydrocarbons, based on average response of xylene isomers.

FIGURES



Source: Richmond Town Tax Map #21

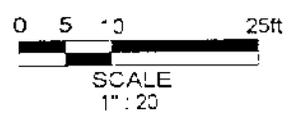
Project No: 86057	Designed By: <u>ljb</u>	TWIN STATE ENVIRONMENTAL CORP. 1A Huntington Rd. P.O. Box 719 Richmond, Vermont (802) 434-3350	FIGURE 1 SITE LOCATION MAP Richmond Town Highway Garage Richmond, Vermont
	Checked By:		
	Approved By:		
	Drawn By: <u>jpb</u> Scale: 1" = 400' Date: 07/23/96		



- GP-1 (34 ppm)
- GP-2 (0 ppm)

RICHMOND TOWN HIGHWAY GARAGE

THOMPSON ROAD

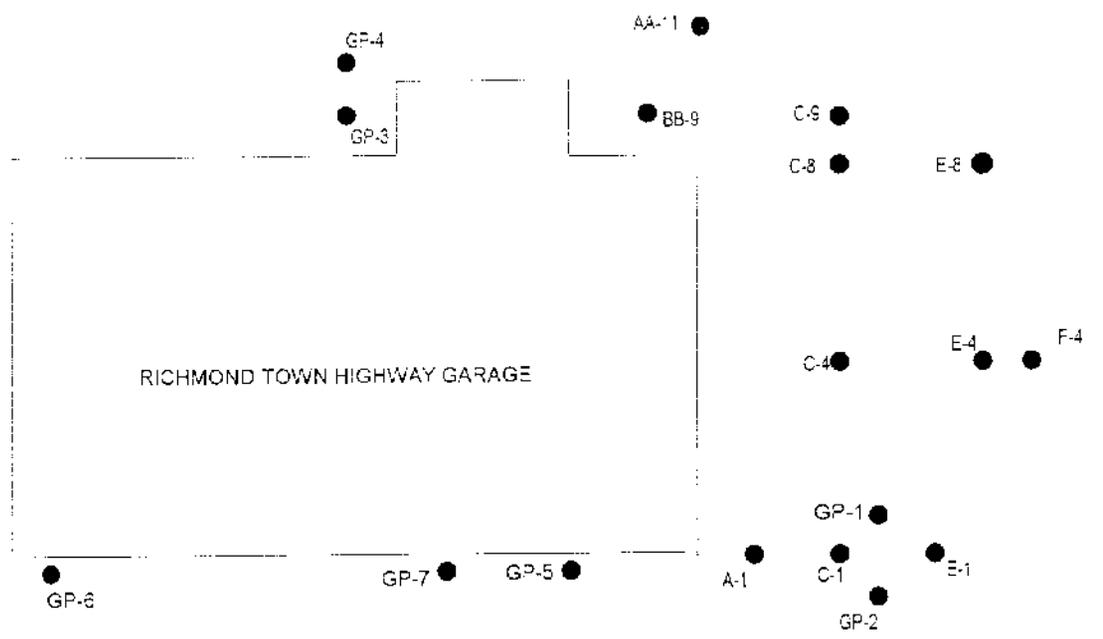


Project No.: 96-067	Designed By: JRD
	Checked By:
	Approved By:
	Drawn By: JRD
	Scale: As Shown
	Date: 7/12/96

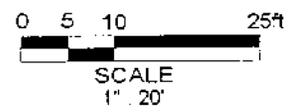
TWIN STATE ENVIRONMENTAL CORP.
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P.O. Box 719
Richmond, Vermont
802-434-3360

FIGURE 2
SITE PLAN
Richmond Town
Highway Garage
Richmond, Vermont

SALT
SHED



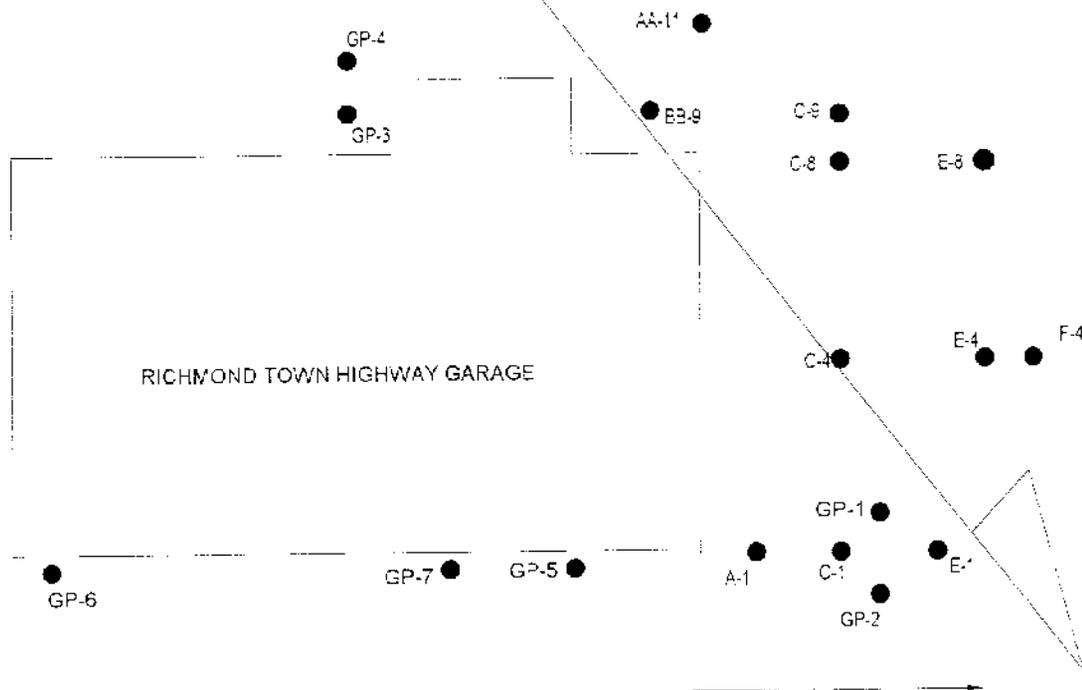
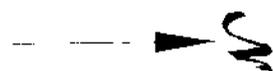
THOMPSON ROAD



Project No.: 96-067	Designed By: JRD	TWIN STATE ENVIRONMENTAL CORP. 1A Huntington Rd. P.O. Box 719 Richmond, Vermont 802-434-3360	FIGURE 3 BORING LOCATION PLAN Richmond Town Highway Garage Richmond, Vermont
	Checked By:		
	Approved By:		
	Drawn By: JRD		
	Scale: As Shown		
Date: 7/12/96			

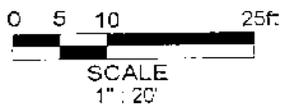
ASSUMED GROUNDWATER FLOW DIRECTION

SALT SHED



RICHMOND TOWN HIGHWAY GARAGE

THOMPSON ROAD

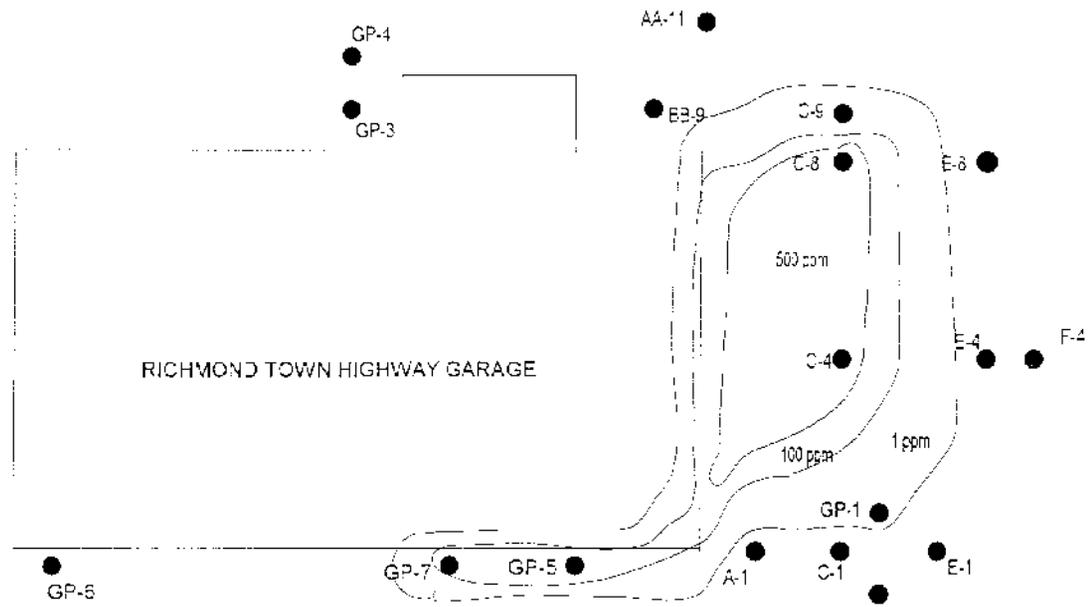


Project No.: 96-057	Designed By: JRD
	Checked By:
	Approved By:
	Drawn By: JRD
	Scale: As Shown
Date: 7/12/96	

TWIN STATE ENVIRONMENTAL CORP.
1A Huntington Rd.
P.O. Box 719
Richmond, Vermont
802-434-3360

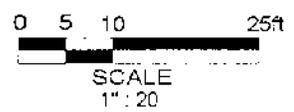
FIGURE 4
GROUNDWATER
FLOW DIRECTION
Richmond Town
Highway Garage
Richmond, Vermont

SALT
SHED



RICHMOND TOWN HIGHWAY GARAGE

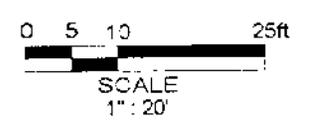
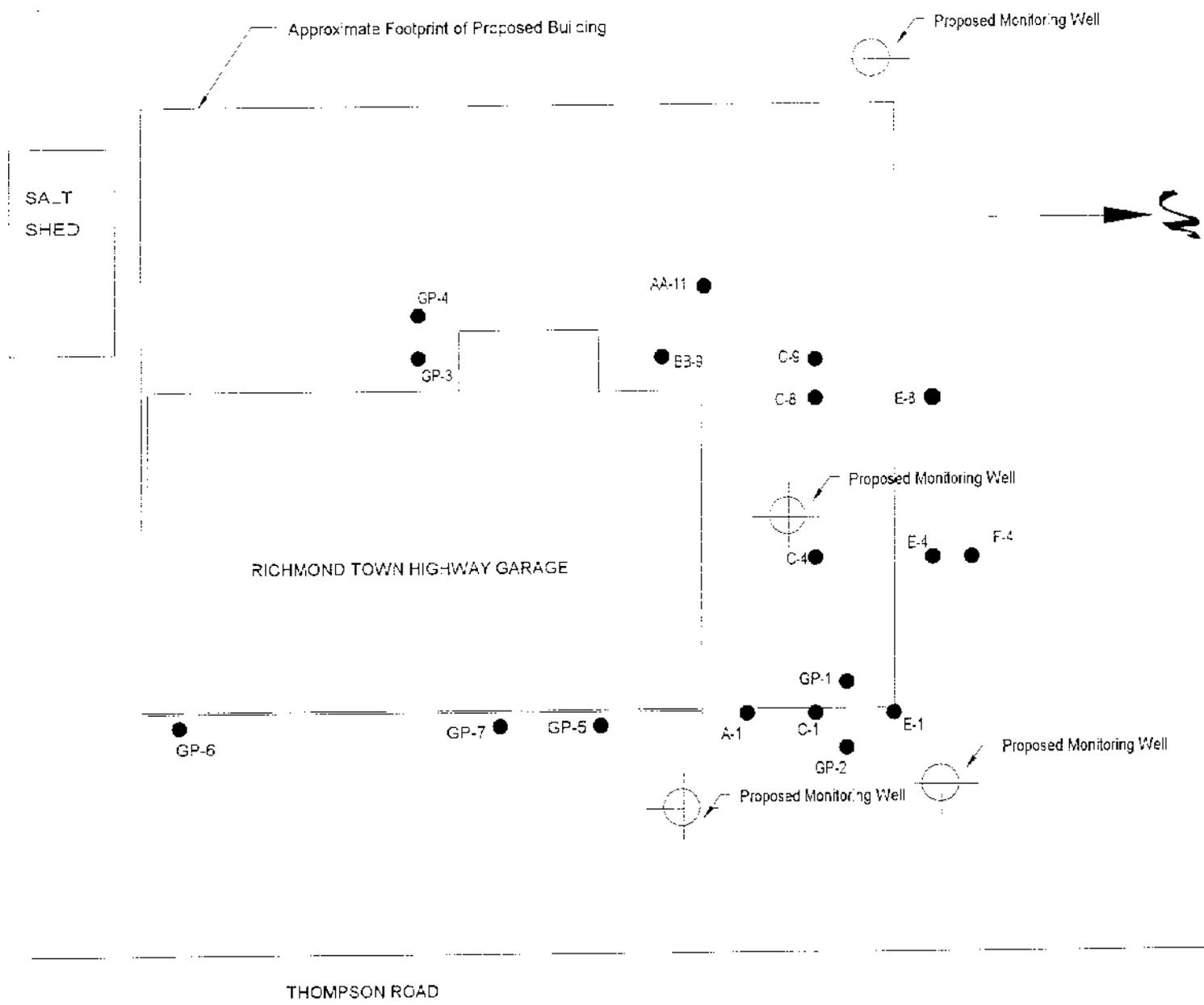
THOMPSON ROAD



Project No.: 96-067	Designed By: JRD
	Checked By:
	Approved By:
	Drawn By: JRD
	Date: 7/12/96

TWIN STATE ENVIRONMENTAL CORP.
1A Huntington Rd.
P.O. Box 719
Richmond, Vermont
802-434-3360

FIGURE 5
HEADSPACE ISOPLETH
Richmond Town
Highway Garage
Richmond, Vermont



Project No.: 96-067	Designed By: JRD	TWIN STATE ENVIRONMENTAL CORP. 1A Huntington Rd. P.O. Box 719 Richmond, Vermont 802-434-3360	FIGURE 6 PROPOSED WELL LOCATIONS Richmond Town Highway Garage Richmond, Vermont
	Checked By:		
	Approved By:		
	Drawn By: JRD		
	Scale: As Shown		
Date: 7/12/96			

APPENDIX A

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: <i>BB-9</i>	DEPTH OF WELL:	DEPTH OF BORING: <i>41</i>
PROJECT NAME: <i>Richmond Town Highway Garage</i>	DEPTH TO WATER:	
PROJECT NO.: <i>96-057</i>	SCREEN DIA.:	DEPTH:
INSTALL DATE: <i>7.11.96</i>	SCREEN TYPE/SIZE: <i>Sched. 40 PVC, 0.010 in. mach. slot</i>	
SEC REP.: <i>John Diego</i>	RISER TYPE: <i>Sched 40 PVC</i>	
DRIILLING CO.: <i>Twin State</i>	RISER DIA.:	DEPTH:
DRIILLING METHOD: <i>GeoProbe</i>	GUARD TYPE:	
SAMPLING METHOD: <i>GeoProbe w/ Macrocore</i>	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1					<p><i>3' sandy fill over 1' dry grey silty clay.</i></p>	
2		<i>0-41</i>	<i>φ</i>			
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: GP-1	DEPTH OF WELL:	DEPTH OF BORING:
PROJECT NAME: Richmond Town Highway Garage	DEPTH TO WATER:	
PROJECT NO.: 96-057	SCREEN DIA.:	DEPTH:
INSTALL DATE: 7-10-96	SCREEN TYPE/SIZE: Sched. 40 PVC, 0.010 in. mach. slot	
TSEC REP.: John Diego	RISER TYPE: Sched 40 PVC	
DRILLING CO.: Twin State	RISER DIA.:	DEPTH:
DRILLING METHOD: GeoProbe	GUARD TYPE:	
SAMPLING METHOD: GeoProbe w/ mucrobore	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS* AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1	0-4'	0-4'	34		- auger fill	<div style="display: flex; flex-direction: column; gap: 5px;"> <div> CEMENT GROUT</div> <div> NATIVE BACKFILL</div> <div> BENTONITE SEAL</div> <div> SAND PACK</div> <div> WELL SCREEN</div> <div> RISER PIPE</div> <div> WATER LEVEL (APPROX)</div> </div>
2						
3						
4	4-8'	4-8'			- auger fill	
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V. LOOSE	<2	V. SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M. DENSE	4-8	M. STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V. DENSE	15-30	V. STIFF		
		>30	HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: <i>GP-1</i>	DEPTH OF WELL: _____ DEPTH OF BORING: <i>8'</i>
PROJECT NAME: <i>Richmond Town Highway Garage</i>	DEPTH TO WATER: _____
PROJECT NO.: <i>46-057</i>	SCREEN DIA.: _____ DEPTH: _____
INSTALL DATE: <i>7-10-96</i>	SCREEN TYPE/SIZE: Sched. 40 PVC, 0.010 in. mach. slot
TSEC REP.: <i>John Diego</i>	RISER TYPE: Sched 40 PVC
DRILLING CO.: <i>Twin State</i>	RISER DIA.: _____ DEPTH: _____
DRILLING METHOD: <i>GeolProbe</i>	GUARD TYPE: _____
SAMPLING METHOD: <i>Geolprobe w/ macrocore</i>	RISER CAP: _____

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1						
2		<i>0-4'</i>	<i>34</i>		<i>- auger fill.</i>	
3						
4						
5						
6		<i>4-8'</i>	<i>0</i>	<i>0%</i>	<i>- pushed stone.</i>	
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS BLOWS/FT DENSITY 0-4 V. LOOSE 4-10 LOOSE 10-30 M. DENSE 30-50 FIRM >50 V. DENSE	COHESIVE SOILS BLOWS/FT DENSITY <2 V. SOFT 2-4 SOFT 4-8 M. STIFF 8-15 STIFF 15-30 V. STIFF >30 HARD	PROPORTIONS USED TRACE 0-10% LITTLE 10-20% SOME 20-35% AND 35-50%	NOTES: 1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.
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TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: GP-2	DEPTH OF WELL: DEPTH OF BORING: 8'
PROJECT NAME: Richmond Town Highway Garage	DEPTH TO WATER:
PROJECT NO.: 46-057	SCREEN DIA.: DEPTH:
INSTALL DATE: 7/10/46	SCREEN TYPE/SIZE: Sched. 40 PVC, 0.010 in. mach. slot
TSEC REP.: John Diego	RISER TYPE: Sched 40 PVC
DRILLING CO.: Twin State	RISER DIA.: DEPTH:
DRILLING METHOD: Geoprobe	GUARD TYPE:
SAMPLING METHOD: Geoprobe w/ microbore	RISER CAP:

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (0-1)	PID (PPMV)	BLOWS/FT AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1						
2		0-4'	Ø		- fill from auger.	
3						
4						
5						
6		4-8'	Ø		- fill from auger.	
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V. LOOSE	<2	V. SOFT	11 TO 15	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M. DENSE	4-8	M. STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V. DENSE	15-30	V. STIFF		
		>30	HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: <i>GP-3</i>	DEPTH OF WELL:	DEPTH OF BORING: <i>8'</i>
PROJECT NAME: <i>Richmond Town Highway Garage</i>	DEPTH TO WATER:	
PROJECT NO.: <i>96-057</i>	SCREEN DIA.:	DEPTH:
INSTALL DATE: <i>7.11.96</i>	SCREEN TYPE/SIZE: <i>Sched. 40 PVC, 0.010 in. mach. slot</i>	
SEC REP.: <i>John Diego</i>	RISER TYPE: <i>Sched 40 PVC</i>	
DRILLING CO.: <i>Twin State</i>	RISER DIA.:	DEPTH:
DRILLING METHOD: <i>GeoProbe</i>	GUARD TYPE:	
SAMPLING METHOD: <i>GeoProbe w/ MacroCore</i>	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	P/D (PPMV)	BLOWS/FT AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1						
2		<i>0-4'</i>	<i>0</i>		<i>- geyser through fill @.</i>	
3						
4						
5						
6		<i>4-8'</i>	<i>1.6</i>		<i>- fill (wet) w/ black staining over damp gray silty clay.</i>	
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRAHULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V. LOOSE	<2	V. SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M. DENSE	4-8	M. STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V. DENSE	15-30	V. STIFF		
		>30	HARD		

NOTES:
 1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.
@ center of tank cavity

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: GP-4	DEPTH OF WELL: _____ DEPTH OF BORING: 12'
PROJECT NAME: Richmond Town Highway Garage	DEPTH TO WATER: _____
PROJECT NO.: 96-057	SCREEN DIA.: _____ DEPTH: _____
INSTALL DATE: 7-11-96	SCREEN TYPE/SIZE: Sched. 40 PVC, 0.010 in. mach. slot
SEC REP.: John Diego	RISER TYPE: Sched 40 PVC
DRILLING CO.: Twin State	RISER DIA.: _____ DEPTH: _____
DRILLING METHOD: GeoProbe	GUARD TYPE: _____
SAMPLING METHOD: GeoProbe w/ Macrocore	RISER CAP: _____

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1						
2		0-4'	0		- Sand fill	
3						
4						
5						
6		4-8'	2		- well-sorted grey sand w/ black staining.	
7						
8						
9						
10		8-12'			- broken macrocore.	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V. LOOSE	<2	V. SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M. DENSE	4-8	M. STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V. DENSE	15-30	V. STIFF		
		>30	HARD		

NOTES:
 1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: GP-5	DEPTH OF WELL:	DEPTH OF BORING: 8'
PROJECT NAME: Richmond Town Highway Garage	DEPTH TO WATER:	
PROJECT NO.: 96-057	SCREEN DIA.:	DEPTH:
INSTALL DATE: 7.11.96	SCREEN TYPE/SIZE: Sched. 40 PVC, 0.010 in. mach. slot	
SEC REP.: John Diego	RISER TYPE: Sched 40 PVC	
DRILLING CO.: Twin State	RISER DIA.:	DEPTH:
DRILLING METHOD: GeoProbe	GUARD TYPE:	
SAMPLING METHOD: GeoProbe w/ Macrocore	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/FT AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1						 CEMENT GROUT
2		0-4'	235		- 3' brown sand fill over grey stained fine sand (diesel odor).	 NATIVE BACKFILL
3						 BENTONITE SEAL
4						 SAND PACK
5						 WELL SCREEN
6		4-8'	43		- grey sand over grey silty clay at 6'.	 RISER PIPE
7						 WATER LEVEL (APPROX)
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V. LOOSE	<2	V. SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	MEDIUM	4-8	MEDIUM	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V. DENSE	15-30	V. STIFF		
		>30	HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: <i>GP-6</i>	DEPTH OF WELL: _____ DEPTH OF BORING: <i>9'</i>
PROJECT NAME: <i>Richmond Town Highway Garage</i>	DEPTH TO WATER: _____
PROJECT NO.: <i>96-057</i>	SCREEN DIA.: _____ DEPTH: _____
INSTALL DATE: <i>7.11.96</i>	SCREEN TYPE/SIZE: <i>Sched. 40 PVC, 0.010 in. mach. slot</i>
SEC REP.: <i>John Diego</i>	RISER TYPE: <i>Sched 40 PVC</i>
DRILLING CO.: <i>Twin State</i>	RISER DIA.: _____ DEPTH: _____
DRILLING METHOD: <i>GeoProbe</i>	GUARD TYPE: _____
SAMPLING METHOD: <i>GeoProbe w/ macrocore</i>	RISER CAP: _____

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS* AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1					<i>- fill over dry silty clay w/ organic matter.</i>	<div style="display: flex; flex-direction: column; gap: 5px;"> <div> CEMENT GROUT</div> <div> NATIVE BACKFILL</div> <div> BENTONITE SEAL</div> <div> SAND PACK</div> <div> WELL SCREEN</div> <div> RISER PIPE</div> <div> WATER LEVEL (APPROX)</div> </div>
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V. LOOSE	<2	V. SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M. DENSE	4-8	M. STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V. DENSE	15-30	V. STIFF		
		>30	HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: <i>GP-7</i>	DEPTH OF WELL:	DEPTH OF BORING: <i>8'</i>
PROJECT NAME: <i>Richmond Town Highway Garage</i>	DEPTH TO WATER:	
PROJECT NO.: <i>96-057</i>	SCREEN DIA.:	DEPTH:
INSTALL DATE: <i>7.11.96</i>	SCREEN TYPE/SIZE: <i>Sched. 40 PVC, 0.010 in. mach. slot</i>	
SEC REP.: <i>John Diego</i>	RISER TYPE: <i>Sched 40 PVC</i>	
DRILLING CO.: <i>Twin State</i>	RISER DIA.:	DEPTH:
DRILLING METHOD: <i>GeoProbe</i>	GUARD TYPE:	
SAMPLING METHOD: <i>GeoProbe w/ MacroCore</i>	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1						
2		<i>0-4'</i>	<i>41</i>		<i>- brown sand over Petro-stained grey sand at 4.5'</i>	
3						
4						
5			<i>173</i>			
6		<i>4-8'</i>				
7						
8			<i>φ</i>		<i>- grey sand grading to grey silt.</i>	
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V. LOOSE	<2	V. SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M. DENSE	4-8	M. STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V. DENSE	15-30	V. STIFF		
		>30	HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: A-1 (Temporary Well)	DEPTH OF WELL: 6.5'	DEPTH OF BORING: 10'
PROJECT NAME: Richmond Town Highway Garage	DEPTH TO WATER: 26.25"	
PROJECT NO.: 96-057	SCREEN DIA.: 1'	DEPTH:
INSTALL DATE: 7.11.96	SCREEN TYPE/SIZE: Sched. 40 PVC, 0.010 in. mach. slot	
SEC REP.: John Diego	RISER TYPE: Sched 40 PVC	
DRILLING CO.: Twin State	RISER DIA.: 1'	DEPTH:
DRILLING METHOD: GeoProbe	GUARD TYPE:	
SAMPLING METHOD: GeoProbe w/ MacroDure	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/FT AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1		0-4'	0	50% rec	- Sand & gravel fill.	
2						
3						
4						
5		4-8'	0	100% rec	- Sand & gravel (2') underlain by damp grey silt.	
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS BLOWS/FT DENSITY 0-4 V. LOOSE 4-10 LOOSE 10-30 M. DENSE 30-50 DENSE >50 V. DENSE	COHESIVE SOILS BLOWS/FT DENSITY <2 V. SOFT 2-4 SOFT 4-8 M. STIFF 8-15 STIFF 15-30 V. STIFF >30 HARD	PROPORTIONS USED FRAC. LITTLE 0-10% SOME 10-20% AND 20-35% 35-50%
--	---	--

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: C-1	DEPTH OF WELL:	DEPTH OF BORING:
PROJECT NAME: Richmond Town Highway Garage	DEPTH TO WATER:	
PROJECT NO.: 96-057	SCREEN DIA.:	DEPTH:
INSTALL DATE: 7.11.96	SCREEN TYPE/SIZE: Sched. 40 PVC, 0.010 in. mach. slot	
SEC REP.: John Diego	RISER TYPE: Sched 40 PVC	
DRILLING CO.: Twin State	RISER DIA.:	DEPTH:
DRILLING METHOD: GeoProbe	GUARD TYPE:	
SAMPLING METHOD: GeoProbe w/ MacroCore	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS* AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1						
2		0-4'	φ	75%	- Sand & gravel fill w/ retro color.	
3						
4						
5						
6		4-8'	φ	100%	- grey med sand over fine sand (to 7.5').	
7						
8						
9					- fine sand w/ silt at tip (grey, wet) ②.	
10						
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21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V. LOOSE	<2	V. SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M. DENSE	4-8	M. STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V. DENSE	15-30	V. STIFF		
		>30	HARD		

NOTES:
 1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.
 ② Bentonite chips added to bottom

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: <i>E-1</i>	DEPTH OF WELL:	DEPTH OF BORING: <i>12'</i>
PROJECT NAME: <i>Richmond Town Highway Garage</i>	DEPTH TO WATER:	
PROJECT NO.: <i>96-057</i>	SCREEN DIA.:	DEPTH:
INSTALL DATE: <i>7.11.96</i>	SCREEN TYPE/SIZE: <i>Sched. 40 PVC, 0.010 in. mach. slot</i>	
SEC REP.: <i>John Diego</i>	RISER TYPE: <i>Sched 40 PVC</i>	
DRILLING CO.: <i>Twin State</i>	RISER DIA.:	DEPTH:
DRILLING METHOD: <i>GeoProbe</i>	GUARD TYPE:	
SAMPLING METHOD: <i>GeoProbe w/ MacroCore</i>	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/FT AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1						
2		<i>0-4'</i>	<i>Ø</i>	<i>25%</i>	<i>- gravel fill.</i>	
3						
4						
5						
6		<i>4-8'</i>	<i>Ø</i>	<i>25%</i>	<i>- gravel fill over grey silt (wet).</i>	
7						
8						
9						
10		<i>8-12'</i>	<i>Ø</i>		<i>- wet grey silt (8-9'), fine grey clayey silt-dry (9-12').</i>	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10X
0-4	V. LOOSE	<2	V. SOFT	LITTLE	10-20X
4-10	LOOSE	2-4	SOFT	SOME	20-50X
10-30	M. DENSE	4-8	M. STIFF	AND	35-50X
30-50	DENSE	8-15	STIFF		
>50	V. DENSE	15-30	V. STIFF		
		>30	HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: <i>E-4</i>	DEPTH OF WELL:	DEPTH OF BORING:
PROJECT NAME: <i>Richmond Town Highway Garage</i>	DEPTH TO WATER:	
PROJECT NO.: <i>96-057</i>	SCREEN DIA.:	DEPTH:
INSTALL DATE: <i>7.11.96</i>	SCREEN TYPE/SIZE: <i>Sched. 40 PVC, 0.010 in. mach. slot</i>	
SEC REP.: <i>John Diego</i>	RISER TYPE: <i>Sched 40 PVC</i>	
DRILLING CO.: <i>Twin State</i>	RISER DIA.:	DEPTH:
DRILLING METHOD: <i>GeoProbe</i>	GUARD TYPE:	
SAMPLING METHOD: <i>GeoProbe w/ MacroCore</i>	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/FT AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1						
2		<i>0-4'</i>	<i>4</i>	<i>70% rec.</i>	<i>- Sand & gravel fill.</i>	
3						
4						
5						
6		<i>4-8'</i>	<i>2 at 5min 7 at 10min</i>		<i>- Silty sand w/ stones (dry).</i>	
7						
8						
9						
10		<i>8-12'</i>	<i>Ø</i>		<i>- Silt at 8.5', dump silty clay (8.5-12').</i>	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V. LOOSE	<2	V. SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M. DENSE	4-8	M. STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V. DENSE	15-30	V. STIFF		
		>30	HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: E-8	DEPTH OF WELL:	DEPTH OF BORING: 8'
PROJECT NAME: Richmond Town Highway Garage	DEPTH TO WATER:	
PROJECT NO.: 96-057	SCREEN DIA.:	DEPTH:
INSTALL DATE: 7.11.96	SCREEN TYPE/SIZE: Sched. 40 PVC, 0.010 in. mach. slot	
SEC REP.: John Diego	RISER TYPE: Sched 40 PVC	
DRILLING CO.: Twin State	RISER DIA.:	DEPTH:
RILLING METHOD: GeoProbe	GUARD TYPE:	
SAMPLING METHOD: GeoProbe w/ macrocore	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS* AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1						
2		0-4'	Ø		- fill over dry grey silt.	
3						
4						
5						
6		4-8'	Ø		- dry silty clay.	
7						
8						
9						
10						
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23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V. LOOSE	<7	V. SOFT	LITTLE	10-20%
4-10	LOOSE	7-14	SOFT	SOME	20-35%
10-30	M. DENSE	14-30	M. STIFF	AND	35-50%
30-50	DENSE	30-50	STIFF		
>50	V. DENSE	>50	V. STIFF		
			HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

ELL/BORING NO.: C-4 (Temporary Well)	DEPTH OF WELL:	DEPTH OF BORING: 12'
PROJECT NAME: Richmond Town Highway Garage	DEPTH TO WATER:	
PROJECT NO.: 96-057	SCREEN DIA.: 1"	DEPTH:
INSTALL DATE: 7.11.96	SCREEN TYPE/SIZE: Sched. 40 PVC, 0.010 in. mach. slot	
SEC REP.: John Diego	RISER TYPE: Sched 40 PVC	
DRIILLING CO.: Twin State	RISER DIA.:	DEPTH:
DRIILLING METHOD: GeoProbe	GUARD TYPE:	
SAMPLING METHOD: GeoProbe w/ Macrocore	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS* AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1		0-4'	493		- sand & gravel fill, gasoline odor.	
2						
3						
4						
5		4-8'	523		- sand & gravel fill, gasoline odor.	
6						
7						
8						
9		8-12'			- grey silty clay, dries out w/ depth.	
10						
11						
12						
13						
14						
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16						
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19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/11	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: C-8	DEPTH OF WELL:	DEPTH OF BORING:
PROJECT NAME: Richmond Town Highway Garage	DEPTH TO WATER:	
PROJECT NO.: 96-057	SCREEN DIA.:	DEPTH:
INSTALL DATE: 7.11.96	SCREEN TYPE/SIZE: Sched. 40 PVC, 0.010 in. mach. slot	
SEC REP.: John Diego	RISER TYPE: Sched 40 PVC	
DRIILLING CO.: Twin State	RISER DIA.:	DEPTH:
DRIILLING METHOD: Geoprobe	GUARD TYPE:	
SAMPLING METHOD: Geoprobe w/ Macrocore	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/1' AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1						CEMENT GROUT
2		0-4'	518		- medium brown sand (backfill) gasoline odor	NATIVE BACKFILL
3						BENTONITE SEAL
4						SAND PACK
5						WELL SCREEN
6		4-8'	466		- medium brown sand (backfill) gasoline odor	RISER PIPE
7						WATER LEVEL (APPROX)
8						
9						
10		8-12'	φ		- fine grey silty sand (wet; 8-10.5') damp silty clay - grey (10.5-12')	
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/1'	DENSITY	TRACE	0-10%
0-4	V. LOOSE	<2	V. SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M. DENSE	4-8	M. STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V. DENSE	15-30	V. STIFF		
		>30	HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

PAGE 1 OF 1

WELL/BORING NO.: <u>C-9</u>	DEPTH OF WELL: _____ DEPTH OF BORING: <u>4'</u>
PROJECT NAME: <u>Richmond Town Highway Garage</u>	DEPTH TO WATER: _____
PROJECT NO.: <u>96-057</u>	SCREEN DIA.: _____ DEPTH: _____
INSTALL DATE: <u>7.11.96</u>	SCREEN TYPE/SIZE: <u>Sched. 40 PVC, 0.010 in. mach. slot</u>
SEC REP.: <u>John Diego</u>	RISER TYPE: <u>Sched 40 PVC</u>
DRILLING CO.: <u>Twin State</u>	RISER DIA.: _____ DEPTH: _____
RILLING METHOD: <u>GeoProbe</u>	GUARD TYPE: _____
SAMPLING METHOD: <u>GeoProbe w/ MacroCore</u>	RISER CAP: _____

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS* AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1					<p><i>- fill over grey silty clay @ 3.5' (dry, stained black and diesel odor).</i></p>	<div style="display: flex; flex-direction: column; gap: 5px;"> <div> CEMENT GROUT</div> <div> NATIVE BACKFILL</div> <div> BENTONITE SEAL</div> <div> SAND PACK</div> <div> WELL SCREEN</div> <div> RISER PIPE</div> <div> WATER LEVEL (APPROX)</div> </div>
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
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GRANULAR SOILS BLOWS/FT DENSITY 0-4 V.LOOSE 4-10 LOOSE 10-30 M.DENSE 30-50 DENSE >50 V.DENSE	COHESIVE SOILS BLOWS/FT DENSITY <2 V.SOFT 2-4 SOFT 4-8 M.STIFF 8-15 STIFF 15-30 V.STIFF >30 HARD	PROPORTIONS USED TRACE 0-10% LITTLE 10-20% SOME 20-35% AND 35-50%	NOTES: 1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.
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TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

WELL/BORING NO.: <u>AA-11</u>	DEPTH OF WELL: _____ DEPTH OF BORING: <u>8'</u>
PROJECT NAME: <u>Richmond Town Highway Garage</u>	DEPTH TO WATER: _____
PROJECT NO.: <u>96-057</u>	SCREEN DIA: _____ DEPTH: _____
INSTALL DATE: <u>7.11.96</u>	SCREEN TYPE/SIZE: <u>Sched. 40 PVC, 0.010 in. mach. slot</u>
SEC REP.: <u>John Diego</u>	RISER TYPE: <u>Sched 40 PVC</u>
DRILLING CO.: <u>Twin State</u>	RISER DIA: _____ DEPTH: _____
DRILLING METHOD: <u>GeoProbe</u>	GUARD TYPE: _____
SAMPLING METHOD: <u>GeoProbe w/ Macrocore</u>	RISER CAP: _____

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1						
2		0-4'	Ø		- sand & gravel fill over silty clay, dump at tip w/ black staining.	
3						
4						
5						
6		4-8'	Ø		- grey silt, becomes dry with increasing depth.	
7						
8						
9						
10						
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19						
20						
21						
22						
23						
24						
25						

GRAHULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

TWIN STATE ENVIRONMENTAL CORP.
MONITORING WELL/SOIL BORING LOG

PAGE 1 OF 1

ELUBORING NO.: F-4	DEPTH OF WELL:	DEPTH OF BORING: 4'
PROJECT NAME: Richmond Town Highway Garage	DEPTH TO WATER:	
PROJECT NO.: 96-057	SCREEN DIA.:	DEPTH:
INSTALL DATE: 7.11.96	SCREEN TYPE/SIZE: Sched. 40 PVC, 0.010 in. mach. slot	
SEC REP.: John Diego	RISER TYPE: Sched 40 PVC	
DRILLING CO.: Twin State	RISER DIA.:	DEPTH:
DRILLING METHOD: GeoProbe	GUARD TYPE:	
SAMPLING METHOD: GeoProbe w/ Macrocore	RISER CAP:	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/FT AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
1					- fill over 3' of dry grey silty clay.	
2		0-4'	φ			
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
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20						
21						
22						
23						
24						
25						

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES:
1. The density of soils were determined by field observations. Ref. to blow counts may not be accurate due to stones, cobbles or boulders that may be encountered.

