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APPLIED GEOLOGY, INC.
ENVIRONMENTAL CONSULTANTS

April 10, 1992

Mr. Carl Ruprect
S.B. Collins, Inc.
54 Lower Welden Street
St. Albans, Vermont 05478

RE: Subsurface Hydrogeologic and Contaminant Investigation Report for The Irasburg General Store, Irasburg, Vermont # 911123

Dear Carl:

Enclosed please find an original and a copy of the above captioned report. After your review, please forward the original copy to Richard Spiese at the Vermont Department of Environmental Conservation. If you have any questions or comments, please do not hesitate to call.

Sincerely,

Susan D'Avignon

Susan D'Avignon
Administrative
Assistant

/smd

Enclosures

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APR 29 1992

SUBSURFACE HYDROGEOLOGIC AND CONTAMINANT INVESTIGATION REPORT FOR THE IRASBURG GENERAL STORE, IRASBURG, VERMONT

Prepared For:

S.B. Collins, Inc.
54 Lower Welden Street
St. Albans, Vermont 05478

April 10, 1992

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EXECUTIVE SUMMARY

The subsurface hydrogeologic and contaminant investigation of the Irasburg General Store site has been performed as a result of leakage of an unknown amount of product from a retail gasoline distribution line in early September 1991. The owners of the underground storage tank and distribution system, S.B. Collins, Inc., immediately repaired the leaking line and requested the investigation of the contamination associated with the release. This investigation has involved the installation of several ground water monitoring wells, collection of ground water elevation, chemical ground water quality, HNU photoionization, ambient indoor air quality, and free phase product identification data. Analysis of this data has revealed that significant plumes of free phase, dissolved phase, and vapor phase gasoline contamination exists beneath the site. Natural ground water and contaminant flow is away from the source area towards a lightly populated residential district.

In an effort to mitigate off-site migration of contaminants, a containment system comprised of a ground water depression well and activated carbon treatment system was installed. The system has been operational since February 1992. Monitoring and analysis of data collected on-site since that time indicates that the containment system has a limited effect on ground water and contaminant flow beneath the site. The system is currently containing the majority of contamination. However, the presence of extremely heterogeneous soils and on-site sewage disposal systems is affecting the efficiency of the system and the prediction of contaminant flows off-site. The current potential risk to human health due to the presence of the contamination is low. However, the potential for off-site migration of the contaminant plume is considered to be moderate to high.

Recommendations regarding on-site work to ensure that no off-site migration of contamination occurs include the continued operation of the current remedial system in conjunction with further investigations to more fully define the specific ground water and contaminant flow regimes beneath the site. The proposed additional investigation includes detailed soil sampling and mapping, analysis of the affects of on-site sewage disposal, and the optimization and development of the current ground water depression well. Investigation and testing regarding the application of a soil venting system and enhancement of natural biodegradation are also recommended as potential cleanup enhancement methodologies. After detailed review of the recommendations put forth regarding enhancing site cleanup efficiency, it is recommended that a comprehensive and complete work plan be generated to ensure appropriate performance of all applicable work.

In the interim, the collection of ground water elevation, ground water quality, and photoionization device data will continue on a weekly basis. This data will be analyzed to ensure that potential off-site migration is not occurring.

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TABLE OF CONTENTS

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LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

I. INTRODUCTION

A. History

In early September 1991, the regular unleaded gasoline distribution pump at the Irasburg General Store (IGS) lost its prime and would no longer deliver product. The operator of the IGS immediately notified the owners of the underground storage tanks and distribution systems, S.B. Collins, Inc. (SBC). SBC investigated the delivery pump difficulty and discovered that the distribution line between the 4,000 gallon underground storage tank (UST) and the subject pump was actively leaking. Further investigation by SBC indicated that greater than 0.20 feet of free phase gasoline type product was present in a monitoring well directly associated with the delivery line. The subject delivery line was immediately repaired and integrity tested to ensure that it was tight. SBC also immediately contacted Lincoln Applied Geology, Inc. (LAG) and requested that a complete subsurface hydrogeologic and contaminant investigation be initiated. This work was begun by LAG on September 5, 1991 and remedial efforts have continued to date.

B. Location

The IGS is located at the junction of Vermont Routes 14 and 58 in the town of Irasburg, Vermont. Irasburg is located in the center of Orleans County in northeastern Vermont. The site is generally located on **Figure 1**. A detailed site map showing pertinent structures and features is included as **Figure 2**.

Topographically the IGS resides atop a hill which slopes towards the north and west. The IGS is surrounded by residential buildings and open fields. Precipitation falling on the site which does not directly infiltrate the soil will flow over the paved surface of the parking lot into the Irasburg Municipal Storm Sewer System, which ultimately drains to the Black River to the north of the site.

All buildings in the general site area are served by individual on-site sewage disposal systems and a municipal drinking water supply system.

C. Subsurface Geology

The subsurface geology is divided into surficial and bedrock geologic regimes. The surficial or unconsolidated geology of the area is generally described as glacial till and/or lake bottom silts and clays. In the portions of the area more closely associated with the Black River valley bottom, well sorted sands associated with recent fluvial depositional environments are found.

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The bedrock geology of the area is that of the Waits River Formation. Both the Barton River and Ayres Cliff members of the Waits River Formation are found in the general site area. The Barton River member is described as an interbedded siliceous crystaline limestone and phyllite, while the Ayres Cliff limestone tends to have thin interbeds of slate. No outcroppings of bedrock are evident in the site area. However, inspection of the Black River reveals bedrock similar in nature to those described above.

D. Business History

The IGS building has been utilized as a retail gasoline distribution area for at least the past 20 years. In conjunction with the retail distribution of gasoline, the building is utilized as a convenience store and is the permanent residence of the IGS owners. The building also has one apartment located directly above the store.

With regard to UST history, currently two USTs are used on-site for gasoline distribution. The locations of these tanks are shown on **Figure 2**. The tanks are 4,000 and 3,000 gallon in capacity. The 4,000 gallon tank contains regular unleaded gasoline. The 3,000 gallon tank contains plus or super grade unleaded gasoline. The tanks are approximately 15 years old and were tightness tested in 1990 and again in 1991. Both tests revealed that the USTs and associated piping were tight. During the recent piping replacement associated with the leak event in September, spill-proof manways were installed around the fill ports of each tank.

A 550 gallon UST is also located on-site. This tank is also shown on **Figure 2**. Currently this tank is being utilized for the storage of home heating fuel. Up until approximately 1989 this tank had been utilized for the retail distribution of kerosene. This tank has not been tightness tested.

Interviews with the current owners of the IGS indicate that over the years significant gasoline odors were commonly detected in the store and basement areas during heavy rainfall events. This "common" occurrence abruptly stopped when the driveway and parking area surrounding the USTs was paved in 1989.

With regard to other potential sources of contamination on-site, several of the residences surrounding the IGS utilize fuel oil for heating purposes. Generally the fuel oil is stored in 275 gallon above ground storage tanks located in the basements of the residences. There are currently no other sources of gasoline in the general site area. Interviews with local officials indicate that the IGS has been the only gasoline distribution location in the area.

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II. SCOPE OF INVESTIGATION

A. Objectives

The objectives of the subsurface hydrogeologic and contaminant investigation were as follows:

1. define the subsurface geologic and hydrogeologic conditions,
2. define the type, phase, areal extent, and degree of contamination,
3. define the source/sources of contamination,
4. design and assist in the installation and operation of a remedial system, and
5. perform a receptor based risk assessment for the properties surrounding the IGS.

B. Methodologies Utilized to Accomplish Objectives

The following methodologies were utilized to accomplish the objectives of the subsurface investigation:

1. application of reconnaissance type mapping regarding surficial and bedrock geology, and location of public drinking water supplies,
2. informal interviews with property owners and personnel acquainted with the general site history,
3. placement, installation, and development of 11 ground water monitoring wells, and one hand augered monitoring well,
4. descriptive logging and olfactory and HNU photoionization device (PID) screening of soils associated with monitoring well installations,
5. complete stadia surveying of the site to allow the generation of a scaled site map and to relate elevations and locations of pertinent structures,
6. regular collection of ground water elevation, product thickness, and PID data from all monitoring points on-site,
7. generation of ground water contour maps indicating flow directions and gradients,

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8. collection and analysis of free phase product samples for laboratory identification,

9. the collection and analysis of chemical ground water quality samples for the presence of petroleum related contaminants,

10. the placement and installation of a 6" diameter ground water depression and product recovery well,

11. the design, installation, and operation of a ground water depression and treatment system,

12. the collection and analysis of ambient indoor air quality samples for the presence of petroleum related contaminants, and

13. the compilation and analysis of all data collected to date.

III. RESULTS OF INVESTIGATION

A total of 12 ground water monitoring points were installed on-site to assist in the determination of the extent and migration routes of ground water and associated contamination. The locations of these monitoring points were determined utilizing data collected from the two existing observation wells on-site, reconnaissance level geologic mapping, and a detailed site walk. The locations of all of the ground water monitoring points located are shown on **Figure 2**. Eleven drilled ground water monitoring wells were installed by SBC and Tri-State Drilling, Inc. under the supervision of LAG. One hand augered monitoring well was installed within the confines of the IGS basement by LAG.

The monitoring wells were installed utilizing hollow stem auger techniques. Split spoon type soil samples were collected on an intermittent basis. Split spoon samples were acquired at least every five feet and more often when deemed necessary, based on PID assays. Each of the soil samples was descriptively logged and screened by olfactory and PID methods. The detailed well logs for each of the drilled monitoring wells installed are included as **Appendix A**.

In general, the soils beneath the site can be described as silty fine sands related to recent alluvial deposition directly overlying a dark brown to olive, mildly weathered glacial till which contains several very thin (less than 1") lenses of well sorted, very fine sands. Beneath this interbedded weathered till and fine sand layer is generally found a brown to olive silty fine sand. This silty fine sand is also till derived. However, it appeared to be weathered to such an extent that it does not contain any clay and is not as dense as the weathered till above it. The brown and olive silty fine sand layer is also saturated with ground water. Below the silty fine sand layer a dense glacial till

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was encountered. This dense till is also brown to olive in color with some fine sand lenses within it. However, this dense till is considerably dryer than the weathered till and silty fine sands directly above it. The fine sand lenses in the weathered till and glacial till were extremely thin and impossible to relate from well boring to well boring as a continuous layer. Some lake bottom type clays were found in the soils associated with MW-10 and MW-11. A pictorial representation of the general soil lithology found throughout the site is presented as **Figure 3**.

The saturated brown and olive silty fine sands appear to be carrying the majority of ground water transmitted through the site. The brown and olive silty fine sand layer is approximately 2.5 feet thick in MW-3 and MW-4. The layer is significantly thinner (i.e. 1.0 to 1.5 feet) in MW-8 and MW-9. However, the small interbedded fine sand lenses of the weathered till above the saturated brown and olive sands do appear to be preferential flow areas for ground water. The till fingers between the sand lenses are very dry while the sand lenses themselves appear mottled and show evidence of perched and confined to semiconfined ground water flow.

The results of the PID assays on the split spoon soil samples and associated well boring cuttings are also included with the well logs in **Appendix A**. Generally, petroleum type vapors were associated with the soils above the water table in MW-3, MW-4, MW-8, and MW-9. Vapors were evident in concentrations greater than 15 parts per million (ppm) as much as nine feet above the obvious area of ground water saturation in each borehole. Free product was obvious on the soils removed from MW-3, MW-9, and to a limited extent in MW-8. The free product saturated soils were associated with the area directly above the ground water surface.

Details regarding monitoring well construction are enclosed in **Appendix A** and pictorially represented in **Figure 3**. In general, once the soil boring was completed to a depth of approximately five feet below the ground water surface, a minimum length of 10 feet of 0.020 inch slotted flush coupled, schedule 40 PVC well screen was installed at the bottom of the boring with sufficient solid riser to reach the ground surface. The annular space between the monitoring well and the borehole walls was progressively sand packed with an artificial silica sand as the hollow stem augers were gradually removed from the ground. The sand pack was placed from the bottom of the boring to a point at least 6" above the top of the well screen. A one foot bentonite seal was then placed directly on top of the artificial sand pack. The remainder of the bore hole was filled with native fill or silica sand and an 8" diameter flush mounted manway with a concrete collar was placed at grade.

Monitoring wells not containing free product were developed utilizing non-turbulent techniques. Development proceeded until at least ten borehole volumes of ground water were removed or the development water ran clear, whichever occurred first. The development water was pumped from the monitoring wells and discharged to the surface directly adjacent to them. Well yields during development were excellent. Up

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to one gallon per minute (gpm) of ground water could be pumped from each well for a period of up to 1.5 hours before well dewatering would occur.

The hand augered well, AH-1, was installed in the IGS basement to assist in determining if the IGS building was acting as a preferred conduit for ground water and/or contaminant flow. The borehole was advanced utilizing a 4" diameter hand auger. The soils encountered were similar to those seen outside the confines of the IGS. PID screening of the soils revealed significant vapor contamination at a depth of two feet below the IGS earthen basement floor. Free phase petroleum product was noted on soils at a depth of five feet. The borehole was stopped at a depth of six feet due to the presence of very stiff till. For this reason, a 2" diameter 0.007 inch slot stainless steel continuous wound well point and 2" diameter steel riser pipe were installed in the borehole and driven to a final completion depth of seven feet. Two additional hand auger placed wells had been proposed for this site. However, the continual use of the IGS basement prohibited the placement of these wells.

Upon completion of monitoring well installation, the entire site was stadia surveyed to relate the top of casings (TOC) of each of the monitoring wells as well as the locations of pertinent structures on-site for the generation of the detailed site map presented as **Figure 2**. The accuracy of the site map is $\pm$ 2 feet. TOC elevations are accurate to within $\pm$ 0.02 feet.

Ground water elevation, product thickness, and PID surveys have been performed on at least a weekly basis since the inception of the investigation. All ground water elevation data collected on-site to date is presented on **Table 1**. Review of **Table 1** indicates that ground water elevations have fluctuated as much as six feet during the past six months. Normally weekly fluctuations in ground water elevation can be as much as two feet. These "flashy" reactions of the ground water to recharge events is a further indication of the perched/confined ground water flow regime indicated by the soil samples obtained during monitoring well installation. The extreme fluctuations in ground water elevation may also be due in part to the leachfields located throughout the site (see **Figure 2**) which can cause artificial ground water mounding and recharge. It should be noted that each of the on-site sewage disposal systems are mound type systems. The mound type design is indicative of soils with either slow percolation rates or perched ground water conditions. Please note that, due to the extreme fluctuations in ground water elevations, the screened area of MW-4 is often completely submerged beneath the ground water surface. This condition also occurs on an intermittent basis in MW-5. Overall ground water elevation trends have been evaluated and will be presented later in this document.

All product thickness data is also presented on **Table 1**. Generally free phase product is continually present in MW-3 and AH-1. Product was also noted on a continual basis in OW-1 between September and early November 1991. Free product has been measured intermittently in MW-8 and MW-9. Free product thicknesses

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beneath the site are generally less than one foot. However, the product thickness in MW-3 has been as great as 3.5 feet. Between September 1991 and late January 1992 the free product was removed from the monitoring wells as often as a three times per week basis. These efforts resulted in the recovery of less than 20 gallons of product. Product thickness trends through time have also been evaluated and will be presented later in this document.

The ground water elevation and product thickness data have been utilized, in conjunction with the scaled site map, to generate ground water contour maps. Ground water contour maps showing typical flow directions and gradients are presented as **Figure 4** and **Figure 5**, which represent data collected on October 15th and November 26th, 1991, respectively. Ground water flow through the site is generally from south toward the north and the Black River. It was anticipated that a more radial type of flow pattern would be evident beneath the site. However, a valley type shape is evident in the ground water contours. As can be seen, this type of flow pattern causes funneling of ground water flow from eastern and western portions of the site toward MW-3, MW-4, and MW-7. Please note that the IGS basement does not appear to affect flow patterns beneath the site.

The distribution of free product beneath the site does not mimic the valley type flow pattern shown on the contour maps. Free product is located in MW-3, directly downgradient of the known piping leak. However, product is also located in MW-8 and MW-9 which appear to be upgradient or sidegradient of the known leak. Both the ground water valley structure and the splitting or spreading of free product may be due to the active use of the leachfields on-site. The large leachfield to the northwest of the IGS may be causing the deflection of ground water contours on the western side of the site. The smaller leachfield located to the northeast of the IGS may be causing the spreading of free product towards MW-8 and MW-9. The actual affects of the leachfields cannot be defined at this time due to lack of ground water monitoring points associated with them.

PID data was collected from the headspace of the monitoring wells on-site during all site visits to monitor ground water elevation and product thickness. The PID data is presented on **Table 2**. Monitoring wells providing PID measurements of greater than 200 ppm on a constant basis are MW-3, MW-8, MW-9, AH-1, and OW-1. These high vapor readings are expected due to the continuous or intermittent presence of free product in all of these wells. MW-4, MW-5, and OW-2 continually show measurable amounts of vapor at much lesser concentrations than the wells containing free product. MW-2 also provides consistent positive vapor readings until very recently. MW-6, MW-7, MW-10, and MW-11 have shown background readings on the PID throughout the investigation.

Samples of the free phase product found in MW-3 and OW-1 were obtained in early October 1991 and analyzed to identify the type of petroleum product/products

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present. The results of these analyses are included as **Appendix B**. The chromatograms and report forms indicate that the product found in each of the samples is gasoline. The lack of late eluting chromatographic peaks indicates that there is not a significant presence of fuel oil type contamination in the free product samples. The product measured in MW-8, MW-9, and AH-1 has not been analyzed by laboratory techniques. However, qualitative visual and olfactory screening of the product found in these wells indicates that it is similar to the gasolines that were found in OW-1 and MW-3.

On September 9th and December 13th, 1991 chemical ground water quality samples were obtained from each of the ground water monitoring wells not containing free phase gasoline. These samples were analyzed for the presence of petroleum related contamination. The samples were taken in accordance with EPA accepted protocols. Each of the monitoring wells was purged of at least three well volumes of ground water prior to sampling with a one time use disposable bailer. The samples were placed in 40 ml glass vials, acidified, and chilled for delivery to the analytical laboratory. The samples were analyzed utilizing chromatographic procedures akin to EPA Methodology 602 with quantification for benzene, toluene, ethyl benzene, total xylenes (BTEX) and methyl tert butyl ether (MTBE). The analytical results sheets for the two sampling rounds are enclosed as **Appendix C**. The results are also summarized as the sum BTEX/MTBE concentrations on **Table 3**.

Review of **Table 3** indicates that measurable amounts of dissolved petroleum contamination are associated with MW-2, MW-4, MW-5, MW-8, MW-10, and OW-2. The concentrations of contaminants in OW-2 appear to have decreased significantly between the September and December sampling. In general, the relative concentrations of dissolved contaminants in each of these wells mimics the PID data collected on a weekly basis.

Review of the ground water quality result sheets enclosed in **Appendix C** indicates that there is little to no MTBE present in any of the ground water samples collected on-site. Conversations with SBC personnel indicate that the product delivered to this site is obtained from same source as the product delivered to other SBC sites LAG is currently monitoring. Each of these sites (Masses Minit Mart, Swanton Bait and Tackle) show evidence of MTBE being a considerable percent of the total contamination noted on-site. Further review of the report sheets also indicates that mildly contaminated wells (i.e. MW-2, MW-4, MW-5, and MW-10) do not contain benzene. The lack of benzene and MTBE often indicates the presence of either extremely weathered gasoline, or fuel oil type contamination. This appears to be in direct conflict with petroleum identification analyses performed on the free product samples of OW-1 and MW-3.

There are several possible explanations as to why this type of contaminant distribution is being measured in the ground water on-site. Interviews with the current

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IGS owners indicate that significant gasoline odors were present in the IGS during rain storms until the area surrounding the UST's was black topped in 1989. It is suspected that overfills of the UST's, intermittent small scale spillage and/or leakage, and subsequent migration of gasoline, fuel oil or kerosene has occurred on-site for the lifetime of the tanks. The current dissolved contaminant distribution seen on-site (i.e. the lack of benzene and MTBE) may be indicative of the desorption of contaminants associated with a relatively old leakage problems.

Another potential explanation for the contaminant distribution may be that the natural microbes in the soil and ground water beneath the site have become extremely adept at attacking and degrading petroleum related compounds. This type of degradation may result in the preferential destruction or degradation of contaminants such as benzene and MTBE relative to the heavier more complex compounds. This microbial breakdown of the petroleum contaminants may be assisted by the presence and use of the on-site sewage disposal systems providing nutrients and additional carbon sources which may be used as co-metabolites with the petroleum constituents. It is impossible at this time to determine which, if either, of these scenarios may be responsible for the current make up of contaminants dissolved in the ground water.

Utilizing product thickness, PID, and chemical ground water quality data collected on December 13, 1991, the extent of each phase of petroleum related contamination has been plotted on **Figure 6**. Although chemical ground water quality sampling has not occurred since December 13, 1991, we believe that the current extent of each phase of contamination is nearly the same as is shown on **Figure 6**. This is confirmed by PID and product thickness data collected to date. It is impossible at this time to calculate the potential flow rates of each phase of contamination due to the extreme soil heterogeneity and perched and/or confined ground water flow regime seen beneath the site. These complicating factors also make it impossible to calculate a volume of free phase product beneath the site.

In an effort to control potential off-site migration of free and dissolved phase contamination a ground water depression/product recovery well and ground water treatment system were located and installed during January, 1992. A single point ground water depression well was chosen over the installation of an interceptor trench type of ground water containment system due to the excellent well yields seen during the monitoring well development. This data indicated that the recharge of the ground water was sufficient to enable the control of ground water flow utilizing a single pumping point. The overall depth to ground water and potential instability of the soils beneath the water table would have made trenching very difficult. Also, the overall logistical complexities of performing a major excavation on the relatively soft soils, limited space for storage of contaminated soil and clean backfill material, etc. precluded the timeliness and feasibility of installing an interceptor trench. It was felt that if needed, the proposed single ground water depression well could be

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supplemented by utilizing additional recovery wells or potentially performing lateral well extension work at a later date.

The depression/recovery well is located on **Figure 2** and is denoted as RW-1. The location for RW-1 was chosen based on the ground water contour maps and the extent of contamination map presented as **Figure 6.** These resources indicated that placement of the well in this general area would adequately affect ground water and contaminant flow throughout the site despite the potential spreading effect of the nearby on-site sewage disposal system.

RW-1 was installed on December 30, 1991 utilizing hollow stem auger techniques. No split spoon soil samples were obtained during borehole advancement. However, the soil cuttings removed were screened with a PID. The soil types encountered were similar to those previously described. The PID screening revealed significant amounts of contamination beginning at a depth of four feet. At a depth of seven feet free phase product was encountered. The borehole was advanced to a depth of 25 feet at which point refusal was encountered. It is felt that auger refusal was due to the presence of bedrock.

The recovery well is constructed of a 20 foot section of 6" diameter schedule 40 .020" factory slotted well screen, placed at a depth of 21.6 feet. A one foot solid riser was flush coupled to the well screen. Appropriate artificial sand pack and a bentonite seal was placed in the annular space between the well and the borehole wall. The sand pack is approximately one inch in thickness. The recovery well was not developed after its installation.

SBC and LAG designed a ground water depression and treatment system assuming a ground water pumping rate of less than 10 gpm. The ground water depression/free product recovery system is a dual pump system produced by Clean Earth Technologies. Ground water pumped from RW-1 is passed through two 180 lb granular activated carbon units connected in series. The filtered water is then discharged to the storm sewer inlet adjacent to the site, indicated as SS-1 on **Figure 2.** This ground water depression and treatment system design was chosen due to its success on many similar sites that SBC and LAG are currently operating.

With the ground water depression system installed and appropriate treated water discharge permitting complete, active ground water depression was initiated in late January 1992. Analysis of the efficiency of the depression system has been on-going since system startup. Several ground water and liquid level contour maps have been generated to analyze the effectiveness of the ground water depression activities. **Figure 7** presents a liquid level contour map generated from data collected just prior to recovery well startup on January 30, 1992. The types of flow patterns shown are typical of the site during non-pumping periods. After initial system startup, a series of

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difficulties with the depression treatment system needed to be resolved. The most significant problem continues to be the slow recovery rate of RW-1.

Figure 8 and **Figure 9** are ground water contour maps for data collected on March 19th and April 1st, 1992 respectively. These contour maps show ground water flow patterns on site during active ground water depression activities. Review of **Figure 8** and **Figure 9** indicates that RW-1 appears to be controlling ground water flow throughout the site. Flow from areas of the site containing significant amounts of dissolved contamination or free product appears to be contained by the ground water depression surrounding RW-1. A total of approximately 5,000 gallons of contaminated ground water has been pumped to date. This equates to the pumping of approximately 40 gallons per day (gpd). This is considerably less than what was originally anticipated. To date, no free phase gasoline has been recovered from RW-1. However, free product containment appears to be continuing.

Several graphs have been generated to assist in the evaluation of RW-1's ability to control contaminated ground water and free product flow. Control of ground water flow can be analyzed by comparing ground water fluctuations in MW-5, a well not anticipated to be affected by the pumping activities in RW-1 and MW-9, a well which was anticipated to be affected by the pumping activities of RW-1. The ground water elevation data collected through time for MW-5, MW-9, and RW-1 is graphically presented on the **Figure 10**. Review of the graph indicates that ground water fluctuations in MW-9 mimic ground water fluctuations seen in MW-5. This indicates that the ground water depression activities associated with RW-1 may not be completely affecting ground water flow in the area surrounding it.

With regard to RW-1's ability to control the flow of free product, graphs comparing ground water elevation and product thicknesses through time for MW-3, MW-8, and MW-9 have been generated and are presented as **Figure 11**, **Figure 12**, and **Figure 13**, respectively. Review of these three graphs indicate that the fluctuations in product thickness do not seem to be associated with the fluctuations in ground water elevation. However, the graphs do show very concisely how free product thickness throughout the site has decreased significantly since the startup of the ground water depression system in RW-1.

In compliance with the 1272 discharge order, samples are regularly obtained from RW-1 and analyzed for the presence of petroleum related contaminants. The analytical results are presented in **Appendix C** and are summarized on **Table 3**. Review of the contaminant concentrations entering RW-1 indicate that significant contamination exist in the water pumped by RW-1. Review of **Table 3** also indicates that contaminant concentrations are decreasing. Review of the analytical result sheets (enclosed in **Appendix C**) reveal that no MTBE is present in the waters pumped by RW-1. However, benzene is present in high concentrations.

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Compilation and review of the data presented provides an indication that RW-1 has some influence on the ground water and free product flow beneath the site. However, the influence is not as much as we had anticipated. Active development and/or adjustments to the depth of ground water depression within the well may assist in creating a greater effect on the ground water surrounding RW-1. Well development may result in a large volume of ground water entering RW-1 to be pumped and treated. The adjustment of the ground water depression level may reintroduce ground water and/or free product to sand lenses which are currently dewatered and are not an actively transmitting contaminants.

A detailed receptor based risk assessment for the IGS and adjoining properties has been ongoing throughout the subsurface investigation. Research indicates that the municipal water supply and several private domestic water wells are located within a one mile radius of the site. All wells identified within the one mile radius are located and labeled on **Figure 14**. Each of the drinking water wells has been constructed into competent bedrock and has a well casing placed within the borehole. Review of **Figure 14** indicates that all of the wells identified are either hydraulically upgradient or on the opposite side of the Black River as the IGS site. These data imply that each of the subject wells is hydraulically isolated from the contamination at the IGS site.

The location of the well head protection area (WHPA) and the aquifer protection area (APA) associated with the municipal water supply (IBW-4) have been researched. The locations of the WHPA and APA are indicated on **Figure 15**. The justification for the delineation of the WHPA and APA is included in **Appendix D**. The well completion log for the municipal water well (IBW-4) is also included in **Appendix D**. Review of **Figure 15** indicates that the IGS is not with the WHPA/APA and that ground water flow at the IGS is away from the APA.

The site area is served by a municipal storm sewer. This man made structure could potentially be a preferential flow area for migration of contaminants. The location of the storm sewer inlets and approximate locations of storm sewer mains are indicated on **Figure 2**. Measurement of the depth of the main and comparison with ground water elevations indicates that ground water is well below the storm sewer. PID measurements are obtained from SS-1 on a regular basis. This data is presented on **Table 2**. To date, no positive PID readings have been measured.

The IGS and adjoining downgradient residence, the Poginy residence, are both constructed with field stone foundations. The rear two-thirds of the IGS has a poured concrete floor. However, the front portion is earthen. Beneath the Poginy residence is a small basement and crawl space. This type of construction leads to concerns regarding the potential migration of petroleum vapors into the residences. PID readings are obtained weekly from the IGS and Poginy basements. This data is also presented in **Table 2**. Some positive PID readings have been measured in the IGS basement. These readings, however, may be related to the storage of fuel oil in a 275

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gallon above ground storage tank located in the basement. There have been no positive PID readings in the Poginy basement.

In an effort to accurately define ambient indoor air quality, indoor air quality sampling was performed by Aquatec, Inc. in early January 1992. Samples were taken in the IGS, from within the store area, the Smith residence (the back two-thirds of the building) and the second floor apartment located directly above the store. An ambient indoor air sample was also taken from the Poginy residence on the first floor. The samples were obtained and analyzed utilizing EPA Method TO-2.

The results of the ambient indoor air quality sampling are included as **Appendix E**. The benzene concentrations have been summarized for each sampling location on **Table 4**. Review of these results indicates that benzene is present in the IGS store area in a concentration of 3.6 parts per billion (ppb). This concentration is well below the acceptable limit for a business which distributes gasoline. Benzene concentrations were at or less than the 2.0 ppb limit for non-smoking residences in the Smith and Poginy residences. The Smith residence benzene concentration was an average of 2.2 ppb. Please note that the residence is directly attached to the IGS. Cross contamination of benzene vapor may be related to this intimate association. The apartment directly above the IGS store area had a benzene concentration of 3.9 ppb. This level is below the current 5.0 ppb limit for residences containing smokers.

Review of all data collected to date indicates that with the current remedial system operating the potential risk for contamination of the Black River, municipal storm sewer, the drinking water supplies, and ambient indoor air quality is low. However, the potential for soil and unconsolidated aquifer contamination migration off-site is moderate to high.

IV. CONCLUSIONS

In light of the data collected during the investigation and subsequent analysis and presentation, the following conclusions can be made:

1. A leak in the delivery line for the regular unleaded gasoline pumping system was discovered at the IGS in early September 1991. The subject line leak was immediately repaired.

2. The total volume of gasoline product lost due to delivery line leakage is unknown.

3. Free phase gasoline was discovered in a thickness of greater than 0.20 feet in an observation well directly adjacent to the subject line.

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4. The subsurface geology consists of extremely heterogeneous till derived silty fine sands and competent glacial till.

5. The ground water system existing beneath the site appears to be perched.

6. Ground water and contamination associated with the site generally flows from the source area to the north and its ultimate discharge, the Black River.

7. The heterogeneity of the soils beneath the site, coupled with on-site sewage disposal systems, make detailed predication of ground water and contaminant flow difficult.

8. Free phase gasoline has been measured on the ground water beneath the site in thicknesses exceeding three feet.

9. The chemical characteristics of the dissolved contaminant plume indicate that previous spillage of gasoline, kerosene, or fuel oil may have occurred and/or very active natural degradative processes are occurring.

10. The vapor phase plume contaminant is up to six feet in thickness.

11. Installation and operation of a ground water/free phase product containment system appears to affect ground water and free phase product flow throughout the site.

12. The overall affects of the containment system are not yet well defined.

13. The potential risk to the Black River, the Irasburg Municipal drinking water and storm sewer systems, local domestic drinking water systems and the ambient indoor air of the IGS and Poginy buildings is low.

14. The current potential risk for contamination of soils and the unconsolidated aquifer contamination off-site is moderate to high.

In summary of the conclusions, the source of the free product seen on-site (i.e. the leaking delivery line) has been mitigated. Due to the complex native geology and presence of several on-site sewage disposal systems, prediction and control of ground water and contaminant flow is difficult. The current remediation system appears to be controlling contaminant flow. However, the potential for off-site contamination does still exist.

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V. RECOMMENDATIONS

The following recommendations are made in an effort to enhance the efficiency of the current remedial system and ensure that no additional risk to human health or the environment occurs:

1. The operation and maintenance of the current ground water depression and treatment system should continue. This system has been shown to affect the flow of ground water and product beneath the site. Experimentation with the level of ground water depression within the well should continue. Due to the heterogeneity of the soils beneath the site, the current level of ground water depression may be "stranding" product and highly contaminated ground water by dewatering the lenses of fine sand in which they flows. Experimentation with differing levels of ground water depression will assist in determining where the optimum level of operation is.

2. RW-1 should be developed utilizing surge block and/or swab techniques. The development should be performed with a drill rig. The development will enhance the overall effectiveness of depression in and flow of ground water and/or free product to the recovery well. Use of polyphosphate in the development procedures should also be analyzed to see if its use would be advantageous.

3. Ground water elevation, product thickness, and HNU photoionization data should continue to be collected on a weekly basis. This data will be analyzed and entered into the data base for the site so that trends can continue to be analyzed.

4. Chemical ground water quality samples should be collected from all of the monitoring wells on-site on at least a quarterly basis. These samples should be analyzed by EPA Method 602 for the presence of petroleum constituents including MTBE. The results of this continuing sampling will assist in determining if off-site migration of dissolved contamination is occurring and will also assist in determining overall cleanup efficiency.

5. Ambient indoor air quality samples should be taken from the IGS and the Poginy residence on at least one more occasion. These samples should be collected and analyzed utilizing EPA Method T0-2. The results of this sampling will ensure that the residents of the buildings are not being subjected to elevated levels of benzene.

6. Detailed continuous soil sampling should be performed throughout the site. The collection, logging, and PID screening of these samples will assist in the generation of an accurate cross-sectional view of the lithology beneath the

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site. Accurate vertical mapping of the heterogenic lithology will assist in determining specific flow regimes for contaminated ground water and/or free phase product. This information will also assist in optimizing the operation of the current ground water depression system.

7. Two ground water monitoring wells should be placed in direct association with each of the leachfields on the IGS property. The monitoring wells should be constructed so that the relationship between the leachfields and the native ground water surface can be analyzed. This data will assist in determining if the current areal extent of free product is being affected by the use of the leachfields. These wells will also assist in determining overall flow mechanisms throughout the site.

8. One ground water monitoring well should be placed on the eastern side of Route 14 directly across from the IGS. Monitoring of this well will act as a true uncontaminated upgradient well for the site. This well, in conjunction with those from recommendation 7, will also assist in the generation of more accurate ground water contour maps depicting flow patterns both in the source area and input of the site.

9. Samples of the free phase petroleum product found in MW-8, MW-9, RW-1 (if present), and the product currently being delivered to the USTs on-site should be obtained. These samples will be analyzed for petroleum identification, including the presence of MTBE. The sample results and chromatograms will be compared with those of previous analyzed samples. Detailed comparison of the characteristics of the free product found beneath the site will assist in determining relative age, flow rate, and degradation of the product on-site.

10. The use of the 550 gallon fuel oil UST should be terminated. The integrity of this tank is currently unknown and the discontinuance of use will eliminate the potential for fuel oil leakage and subsequent ground water contamination in the future.

11. Investigation of the potential for the installation and operation of a soil vapor extraction system should be performed. This investigation should include the review of the continuous soil sampling results, vapor extraction pump testing of existing monitoring wells, utilization of the Hyperventilate soil vapor extraction system design program and potentially the installation of additional vapor monitoring points. The utilization of soil vapor extraction systems has proven to significantly enhance the efficiency of site cleanup thereby reducing the overall time necessary for the remediation of gasoline contaminated sites. The generation of accurate baseline data is essential in the design of an appropriate soil vapor extraction and treatment system. The services of a professional engineer will be utilized for final system design.

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12. An investigation regarding the current level of biologic activity and its affect on dissolved contamination beneath the site should be performed. This investigation should be performed in conjunction with the continuous soil sampling, chemical ground water quality sampling, and monitoring well installations.

13. Generation of a comprehensive work plan detailing all aspects of future cleanup activities should be generated after detailed review and discussion of the recommendations made above with SBC and the Vermont Department of Environmental Conservation (VDEC). The generation of the work plan will ensure that all necessary details of the proposed investigations and remedial system changes are performed appropriately.

14. Preparation of monthly updates presenting all data collected on-site should continue along with interpretive summaries and recommendations.

VI. REFERENCES

Doll, C.G., Surfical Geologic Map of Vermont, 1970

Doll, C.G., Centennial Geologic Map of Vermont, 1961

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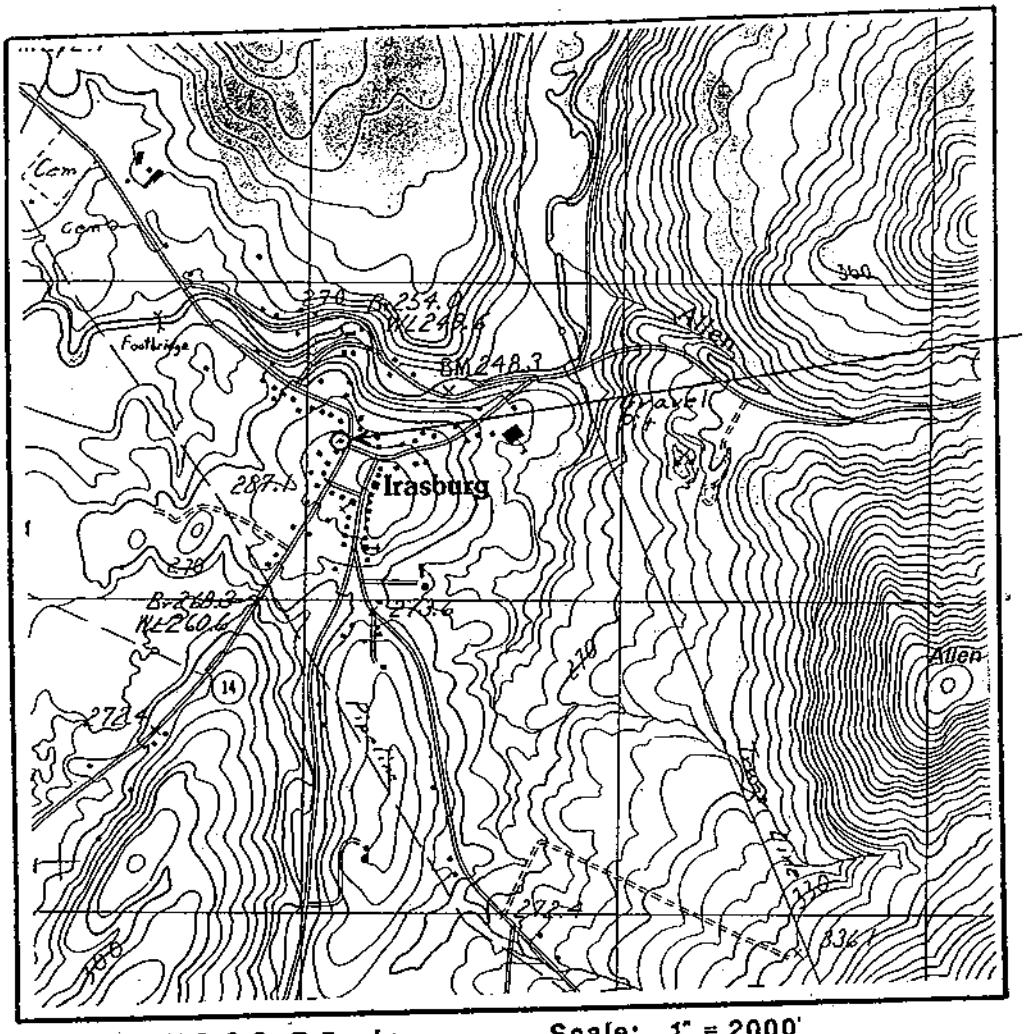
FIGURES

GENERAL LOCATION MAP



Source: U.S.G.S. 7.5 min. Topo. Series Irasburg Quad

Scale: 1" = 2000'

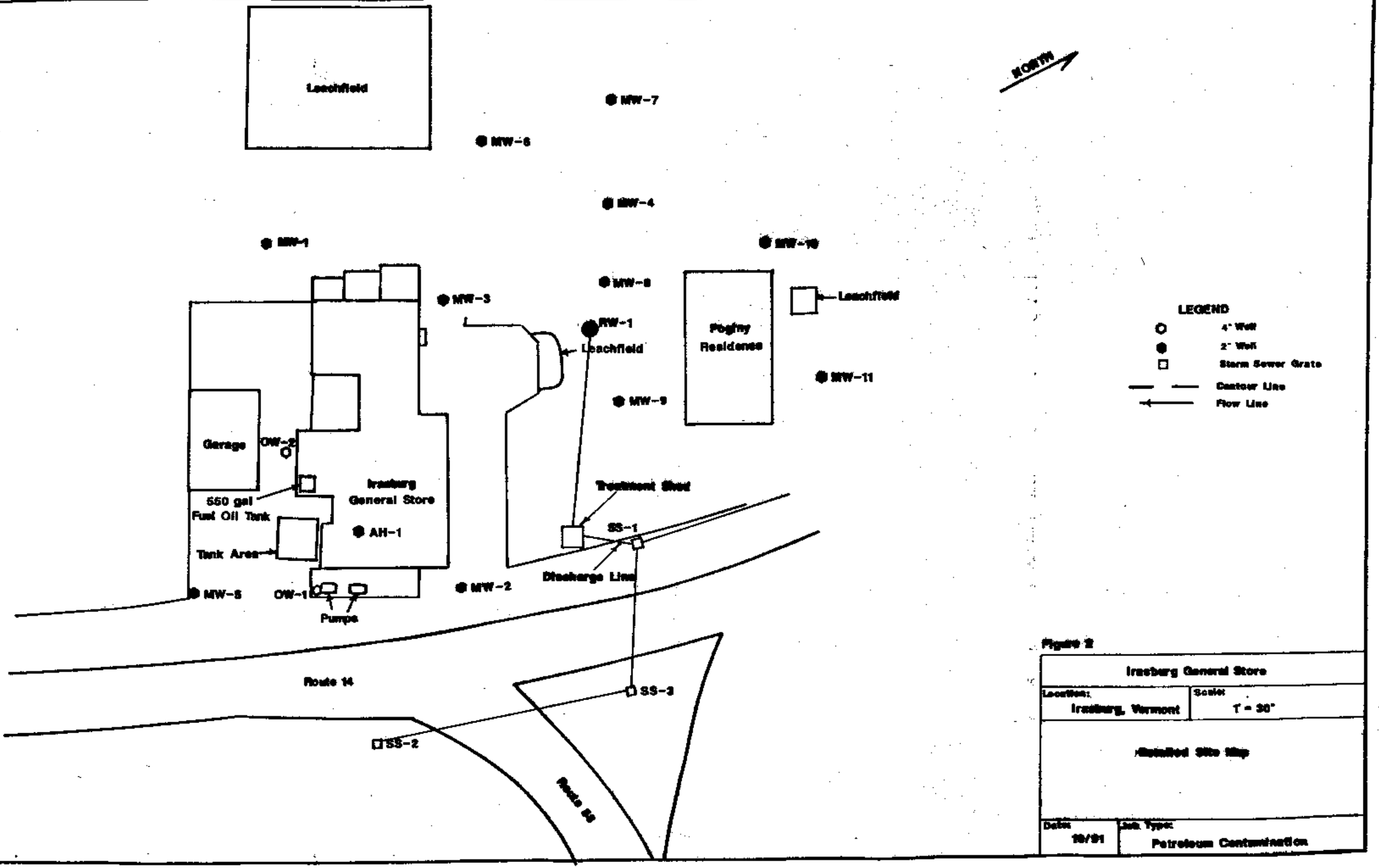


Figure 2

Irasburg General Store

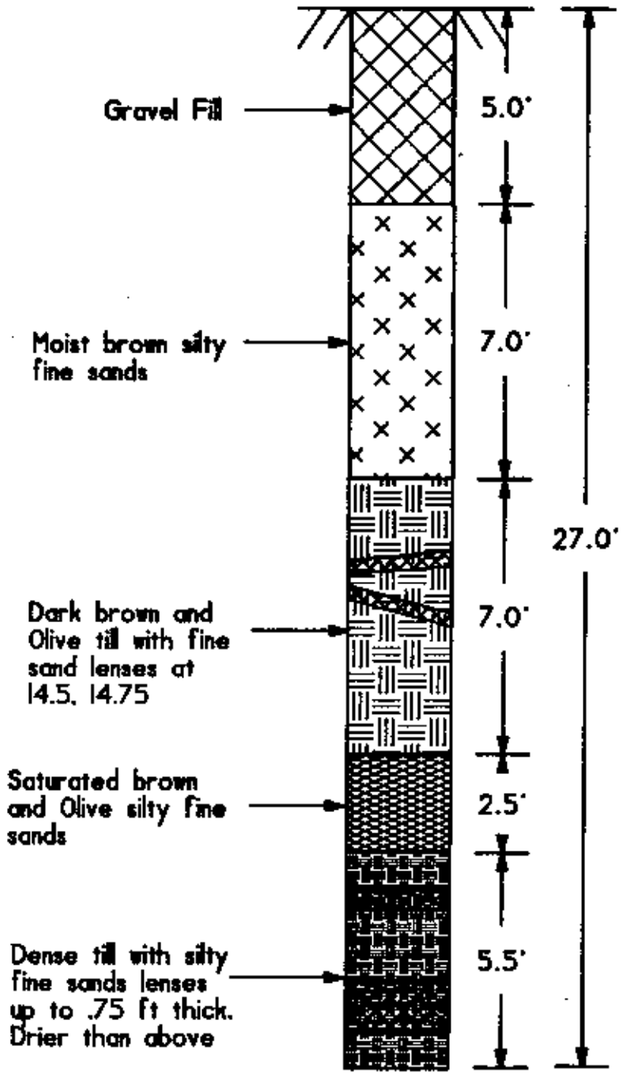
Location: Irasburg, Vermont

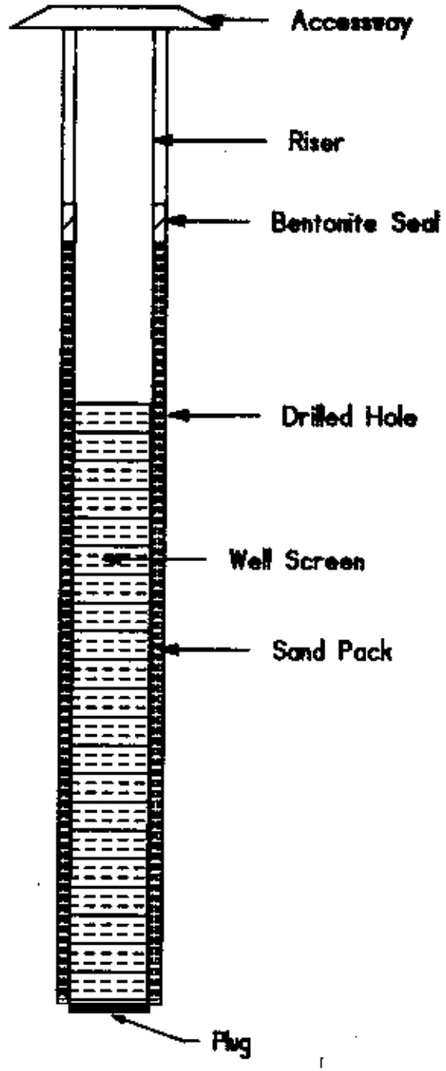
Scale: 1" = 30'

Detailed Site Map

Date: 10/91

Job Type: Petroleum Contamination





Well Log
Irasburg General Store

Well: MW-3

Driller: Tristate

Geologist: Steven LaRosa. Lincoln Applied Geology. Inc.

Date: September 15. 1991

Soils Description:

Depth	Description	HNU
0 - 5'	Gravel Fill	BG
5 - 12'	Moist brown silty fine sands	7'-BG 10'-50 ppm
12 - 19'	Dark brown & olive till with fine sand lenses at 14.5, 14.75	350 ppm
19 - 21.5'	Saturated brown & olive silty fine sands	20 ppm
21.5 - 27'	Dense till with silty fine sands lenses up to .75ft thick. Drier than above.	1 - 5 ppm

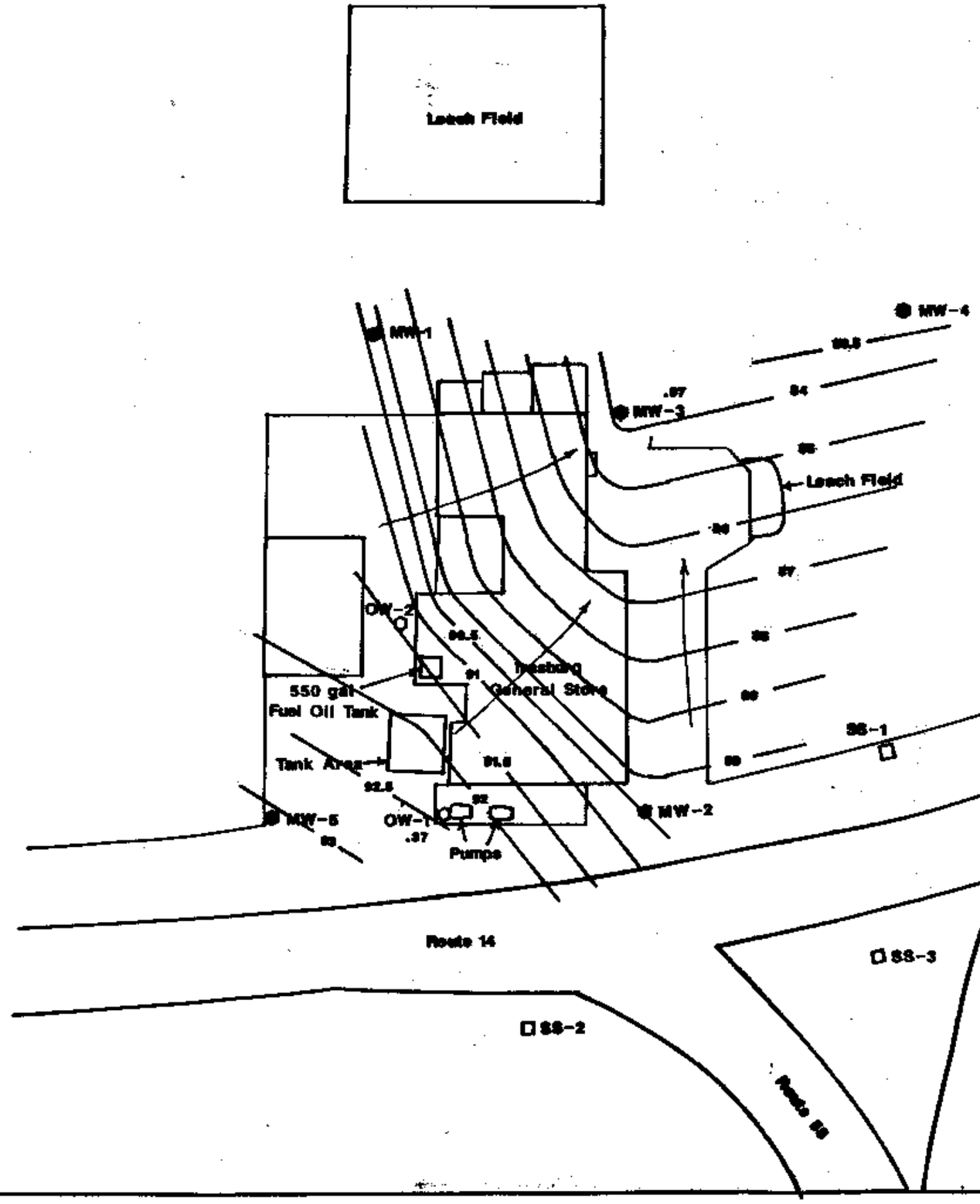
Well Construction:

Bottom of Boring:	25'
Well Screen:	15' .010" slot 2in sch 40 PVC
Solid Riser :	7.5' solid 2in sch 40 PVC
Sand Pack :	25 to 5.5'
Bentonite Seal :	5.5' to 4.5'

Scale: 1" - 4'

IRASBURG GENERAL STORE, IRASBURG, VT
TYPICAL MONITORING WELL

LINCOLN APPLIED GEOLOGY



NORTH

LEGEND

- 2" Well
- 4" Well
- Storm Sewer Grate
- 99 — Contour Line
- Flow Line
- .67 Product Thickness

Figure 4

Irasburg General Store	
Location: Irasburg, Vermont	Scale: 1" = 30'
Ground Water Contour Map for 10/10/91	
Date: 10/91	Job Type:

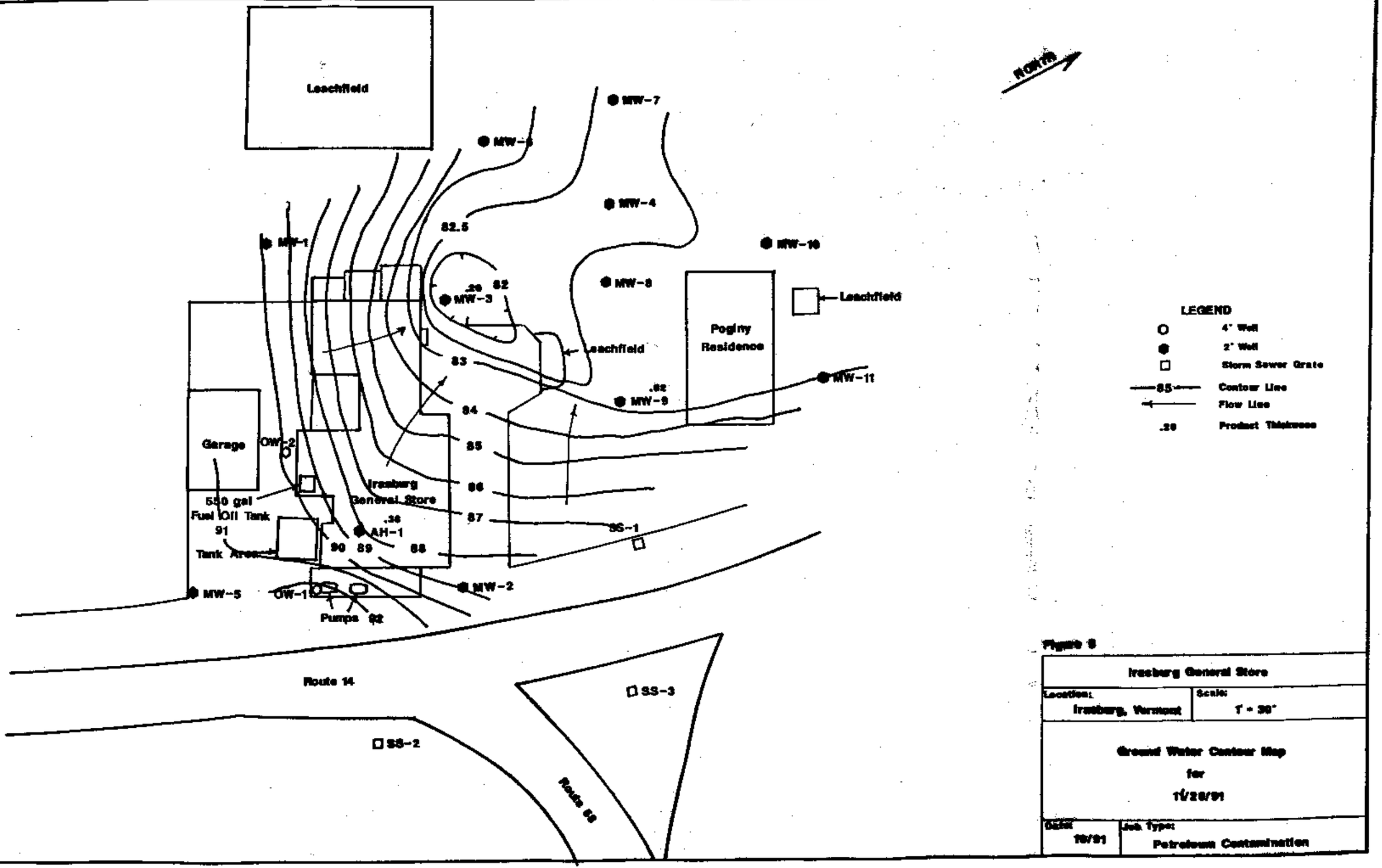


Figure 3

Irasburg General Store	
Location: Irasburg, Vermont	Scale: 1" = 30'
Ground Water Contour Map for 11/26/91	
Date: 12/91	Job Type: Petroleum Contamination

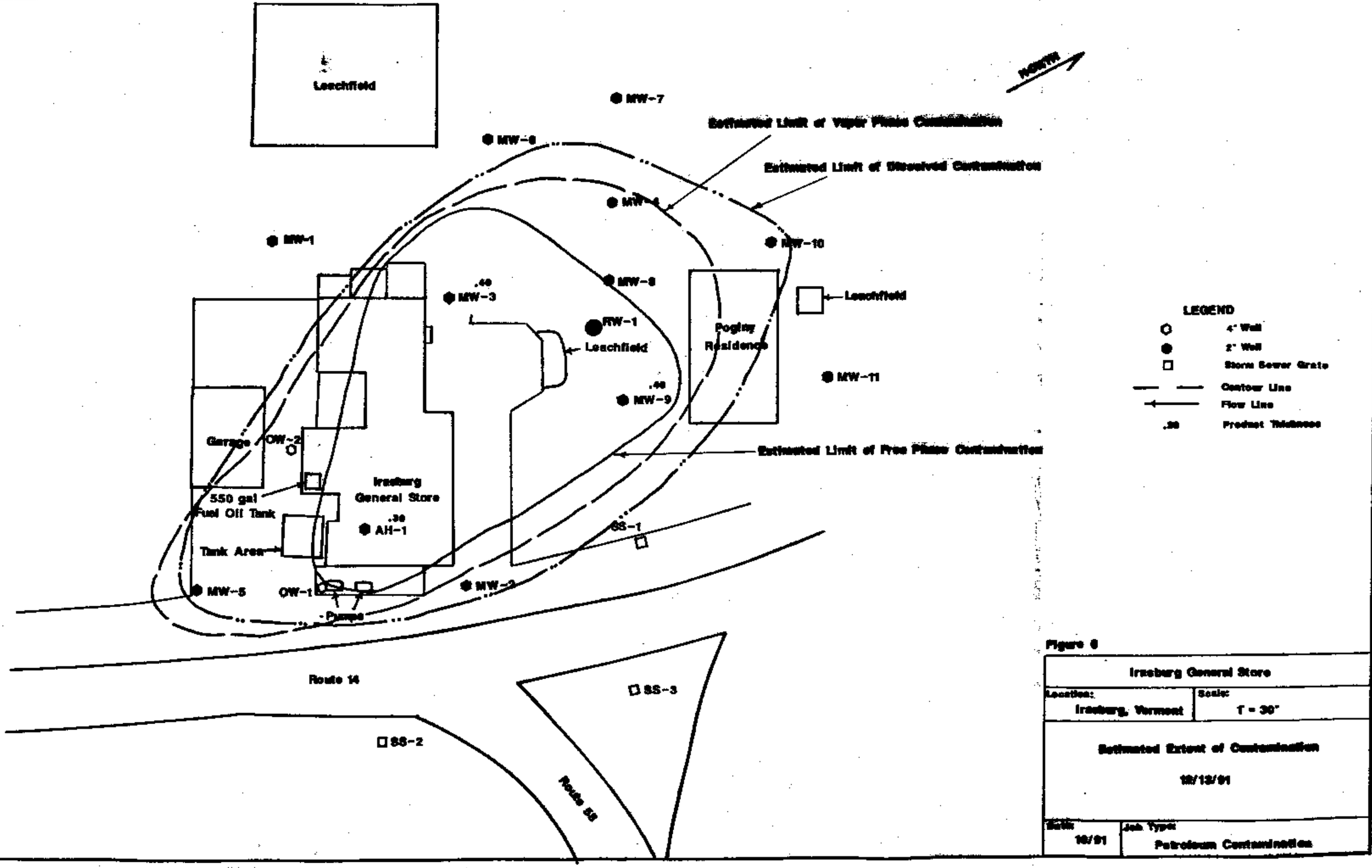


Figure 6

Irasburg General Store	
Location: Irasburg, Vermont	Scale: 1" = 30'
Estimated Extent of Contamination 10/13/91	
Date: 10/91	Job Type: Petroleum Contamination

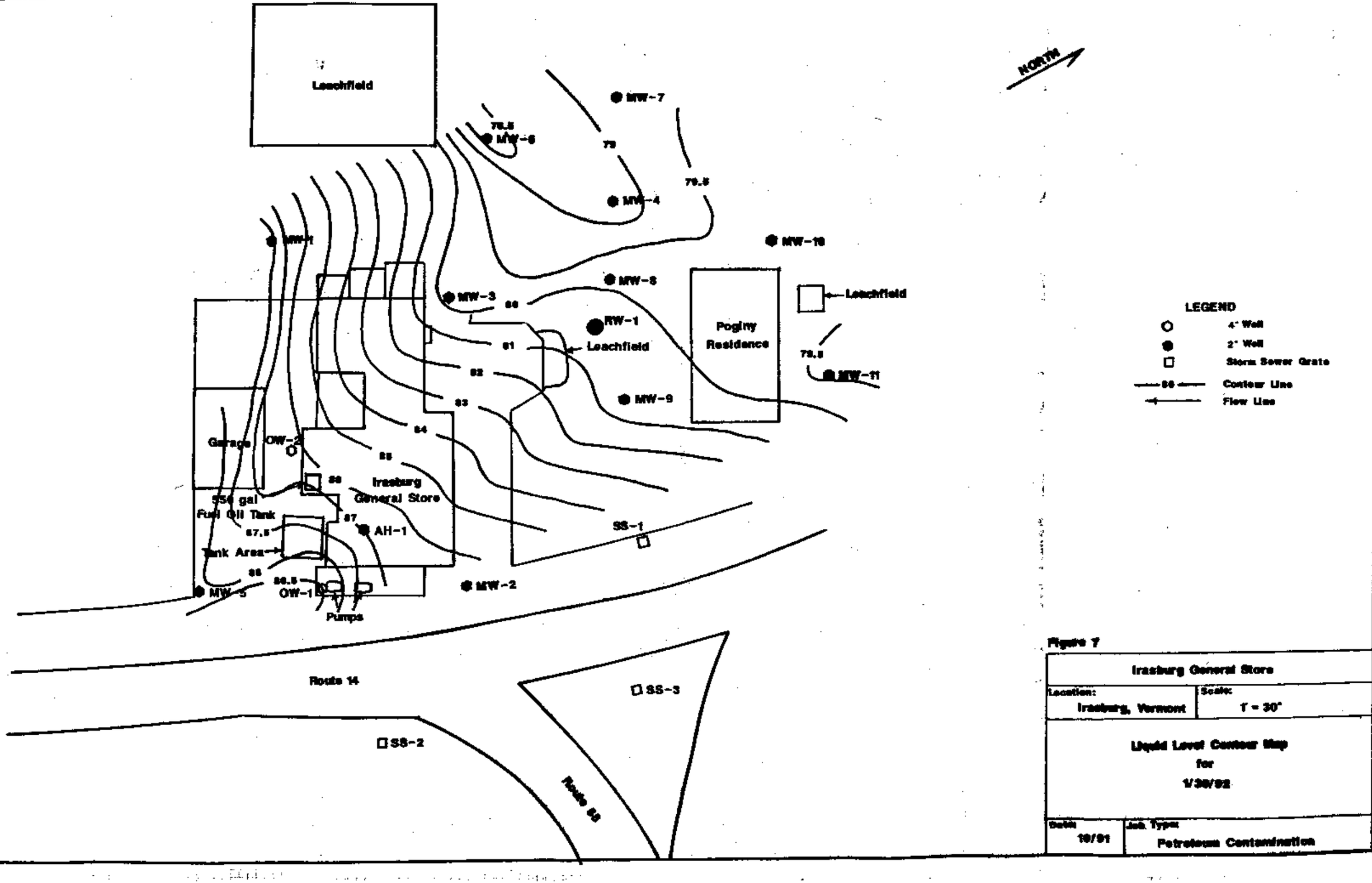


Figure 7

Irasburg General Store	
Location: Irasburg, Vermont	Scale: 1" = 30'
Liquid Level Contour Map for 1/30/92	
Date: 10/91	Job. Type: Petroleum Contamination

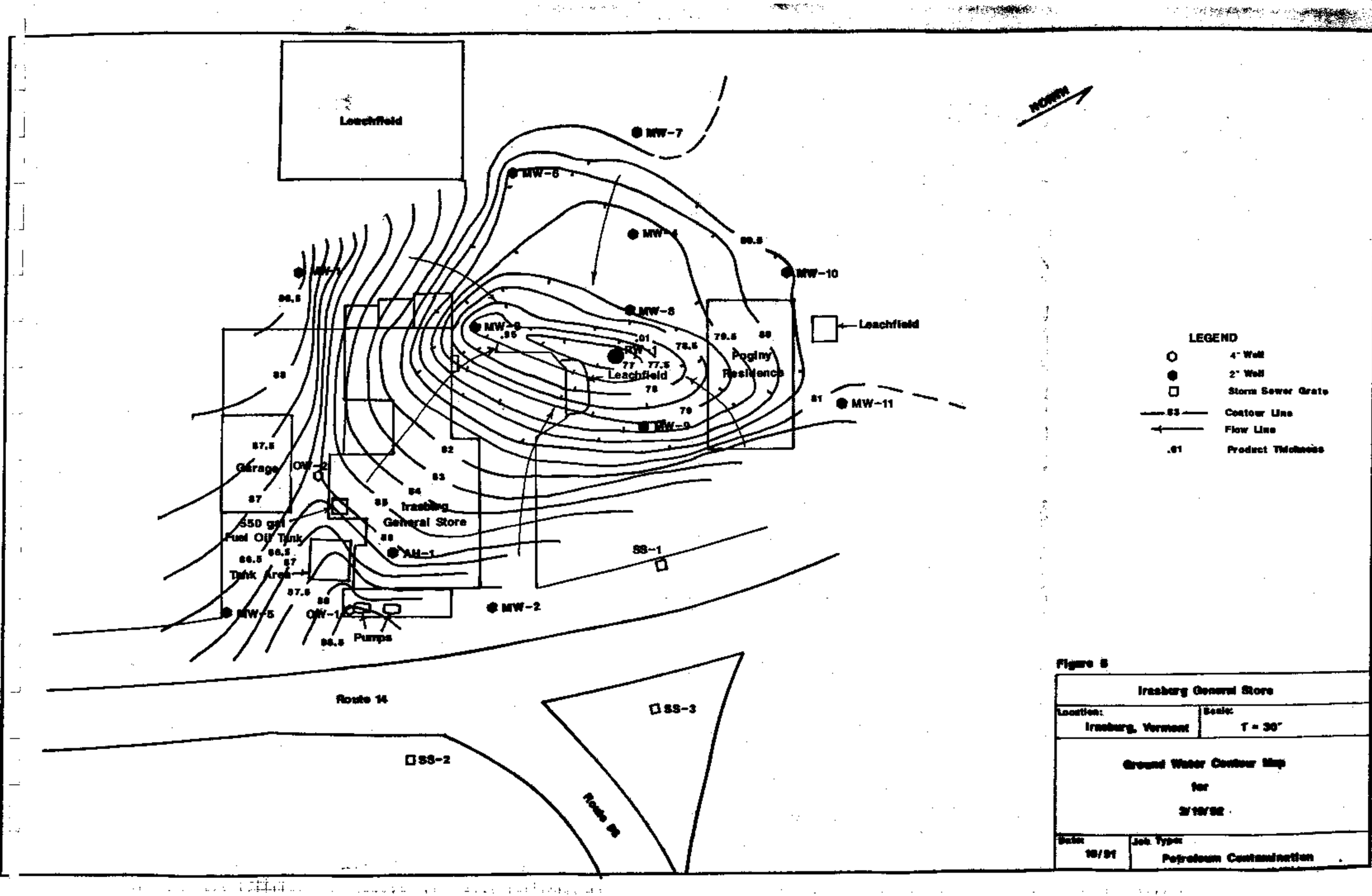


Figure 5

Irasburg General Store	
Location: Irasburg, Vermont	Scale: 1" = 30'
Ground Water Contour Map for 2/19/92	
Date: 10/91	Job Type: Petroleum Contamination

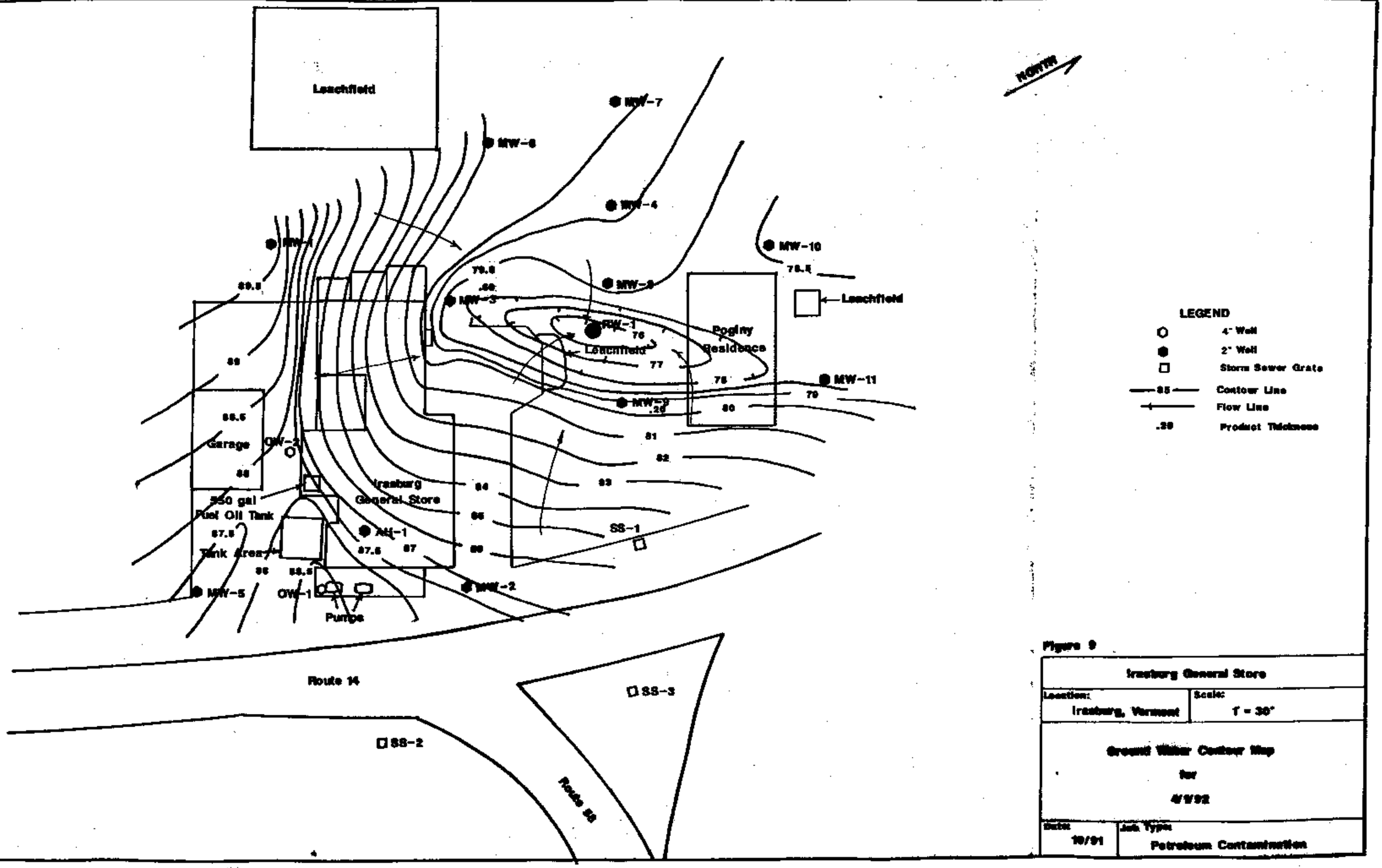


Figure 9

Irasburg General Store	
Location: Irasburg, Vermont	Scale: 1" = 30'
Ground Water Contour Map for 4/1/92	
Date: 10/91	Job Type: Petroleum Contamination

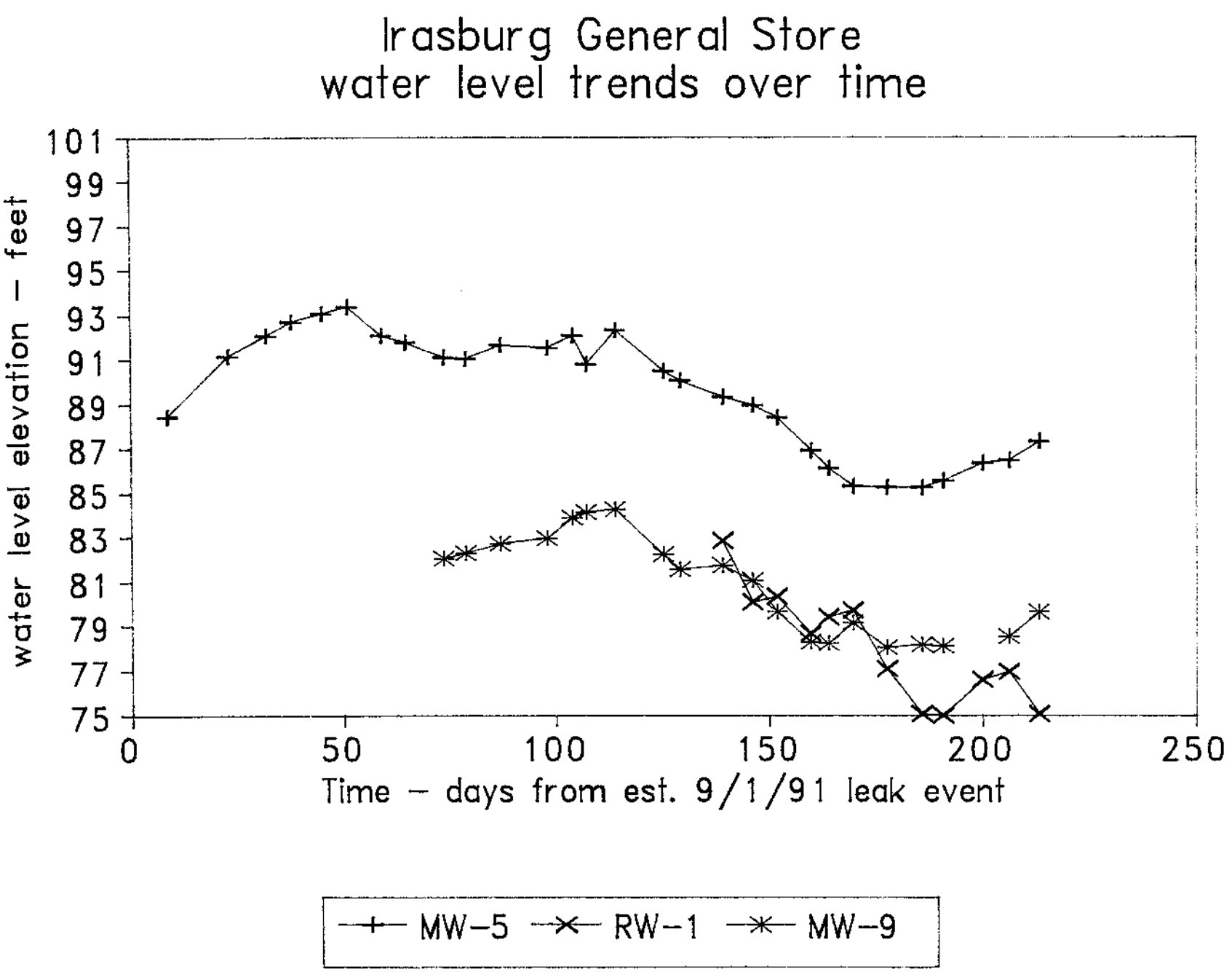

Irasburg General Store
water level trends over time
water level elevation – feet
101
99
97
95
93
91
89
87
85
83
81
79
77
75
0
50
100
150
200
250
Time – days from est. 9/1/91 leak event
MW-5
RW-1
MW-9

Figure 10

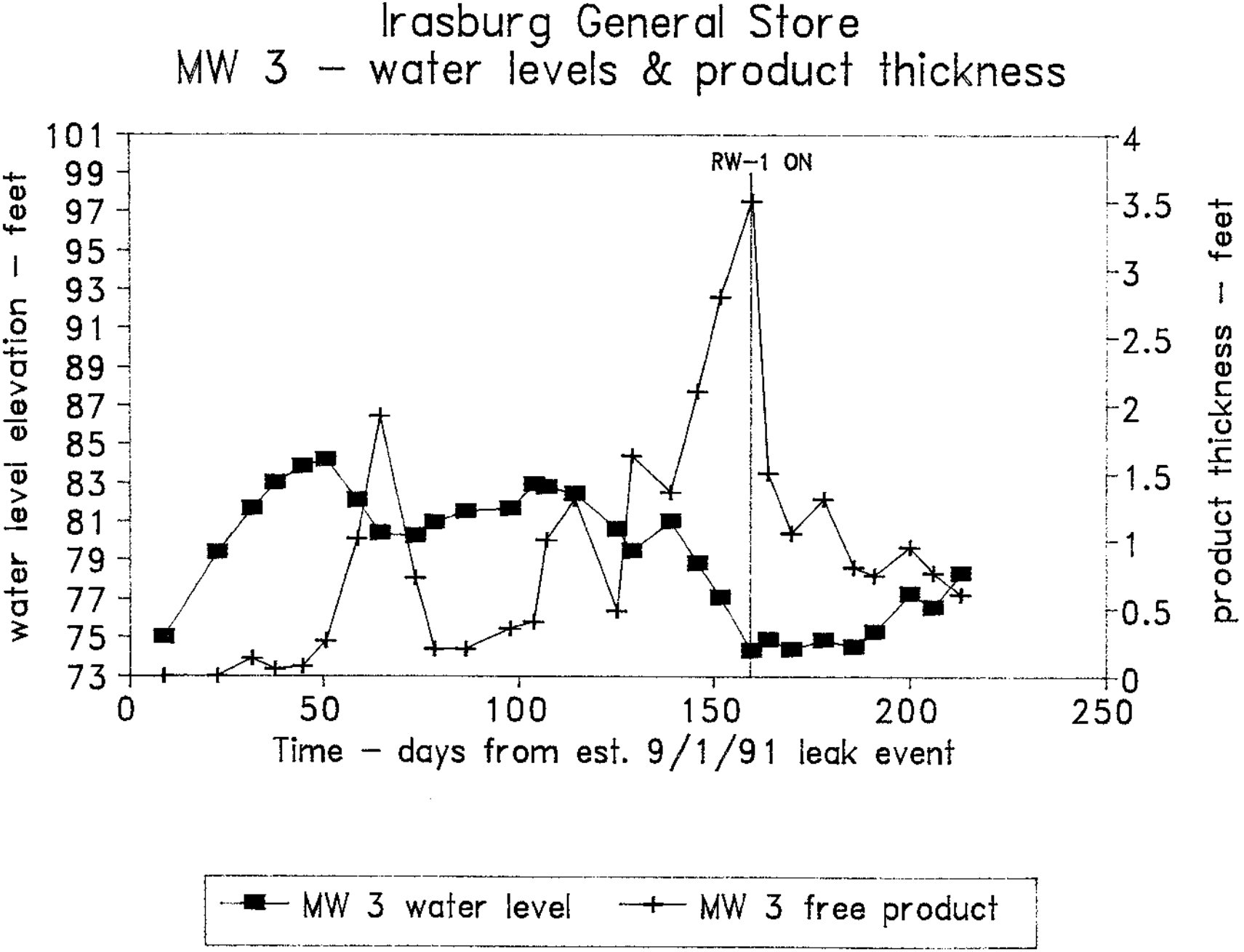

Irasburg General Store
MW 3 – water levels & product thickness
RW-1 ON
water level elevation – feet
product thickness – feet
Time – days from est. 9/1/91 leak event
MW 3 water level
MW 3 free product

Figure 11

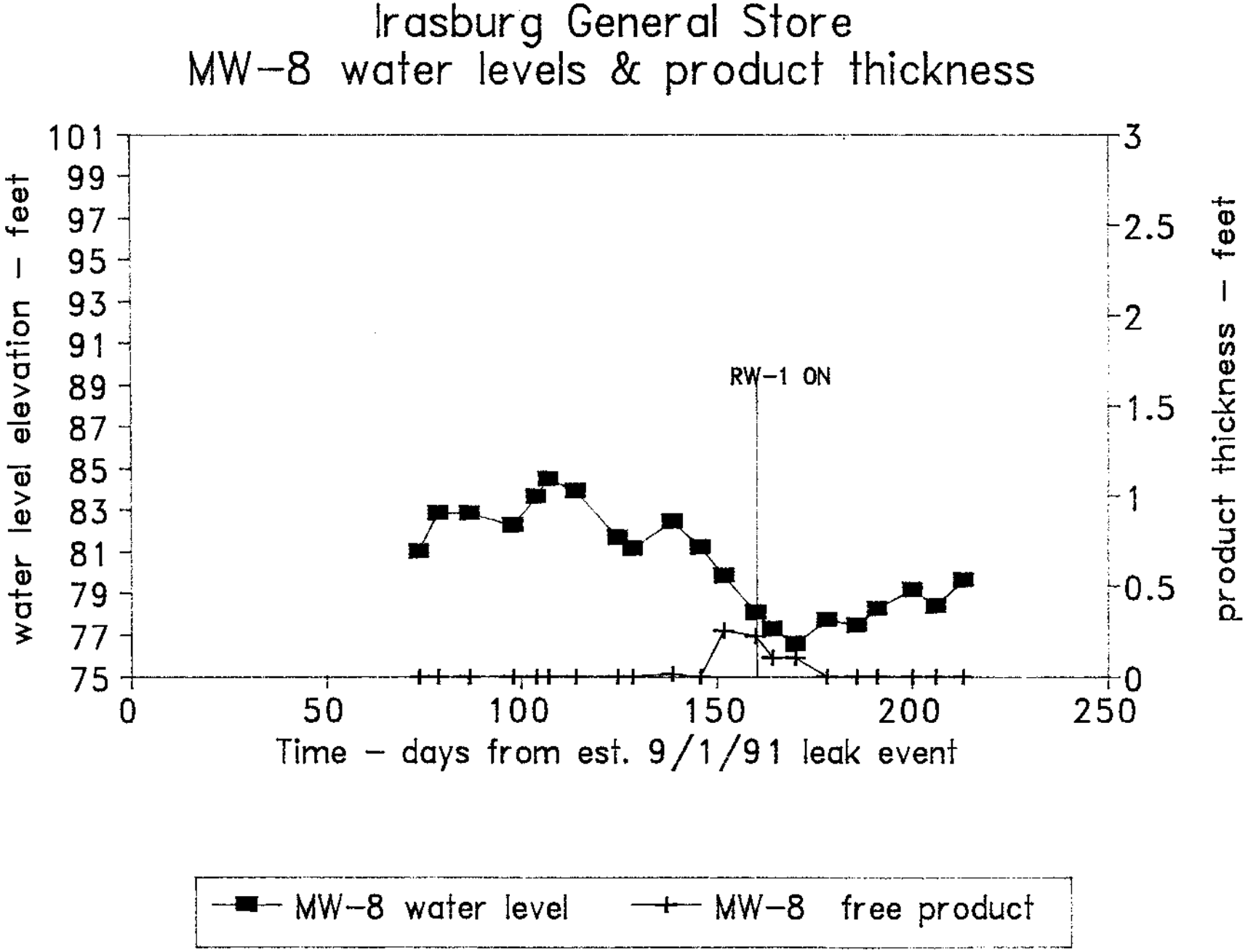

Irasburg General Store
MW-8 water levels & product thickness
water level elevation - feet
product thickness - feet
RW-1 ON
Time - days from est. 9/1/91 leak event
MW-8 water level
MW-8 free product

Figure 12

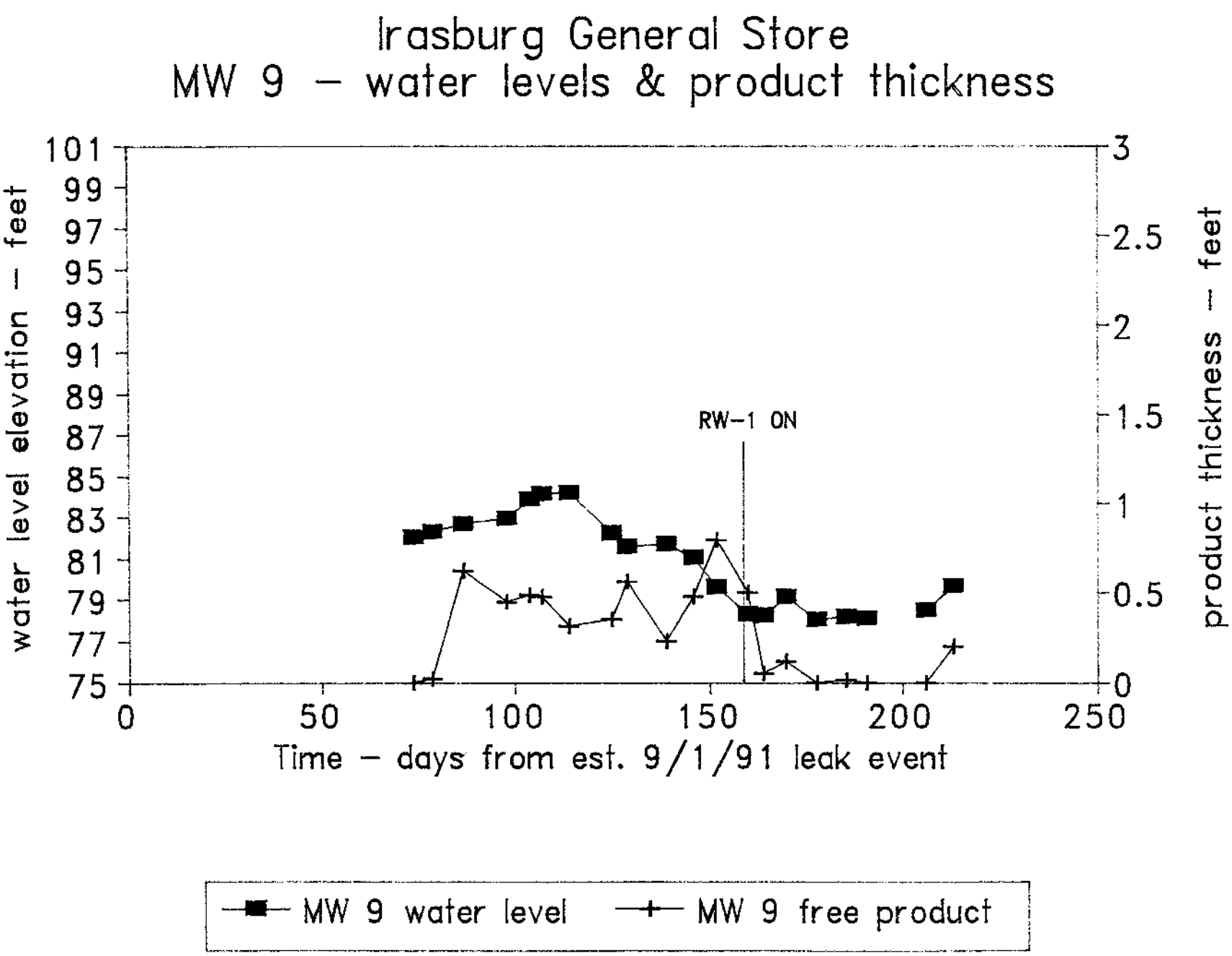
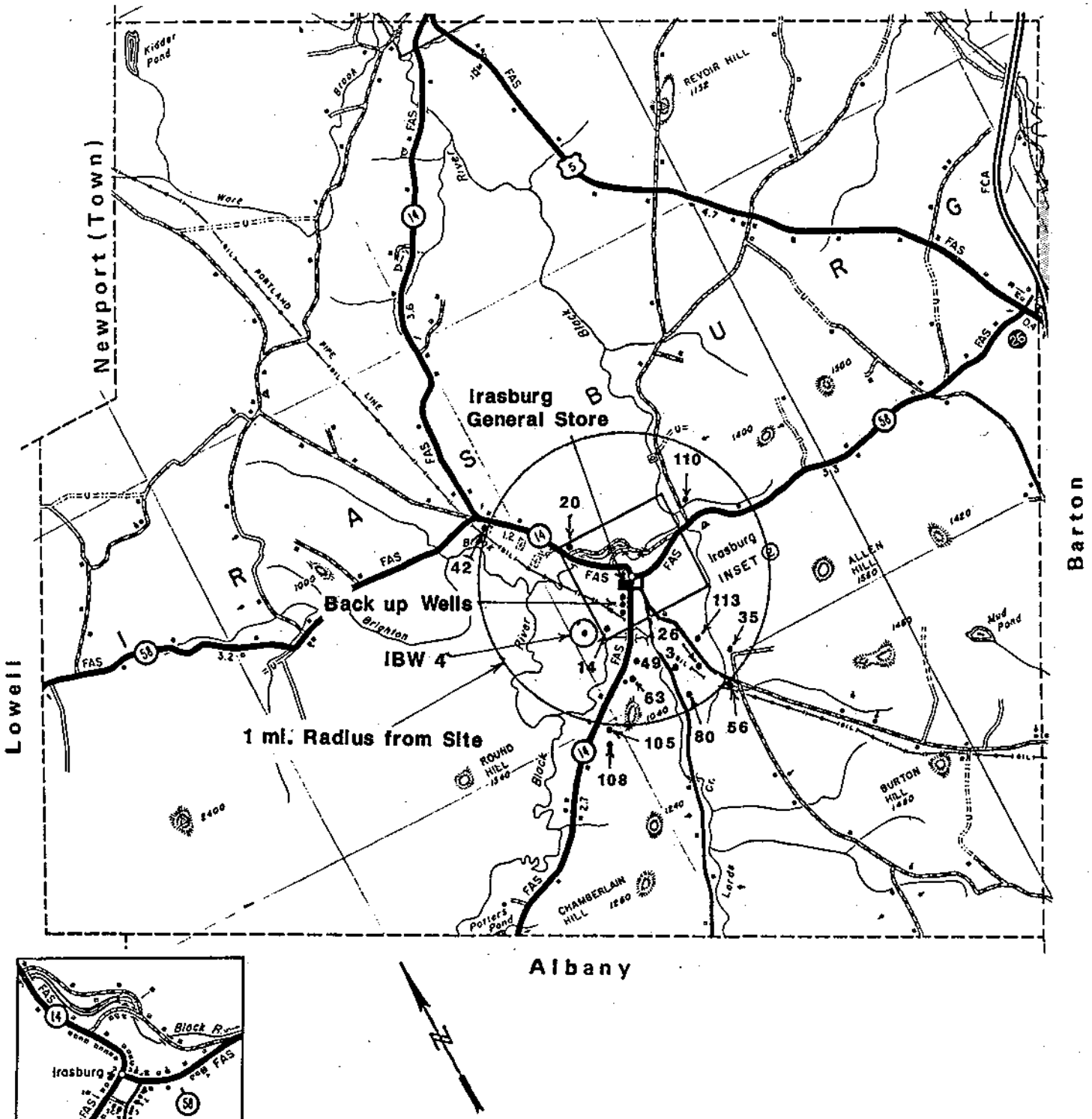

Irasburg General Store
MW 9 – water levels & product thickness
water level elevation – feet
product thickness – feet
RW-1 ON
Time – days from est. 9/1/91 leak event
MW 9 water level
MW 9 free product

Figure 13

Drinking Water Well Location Map

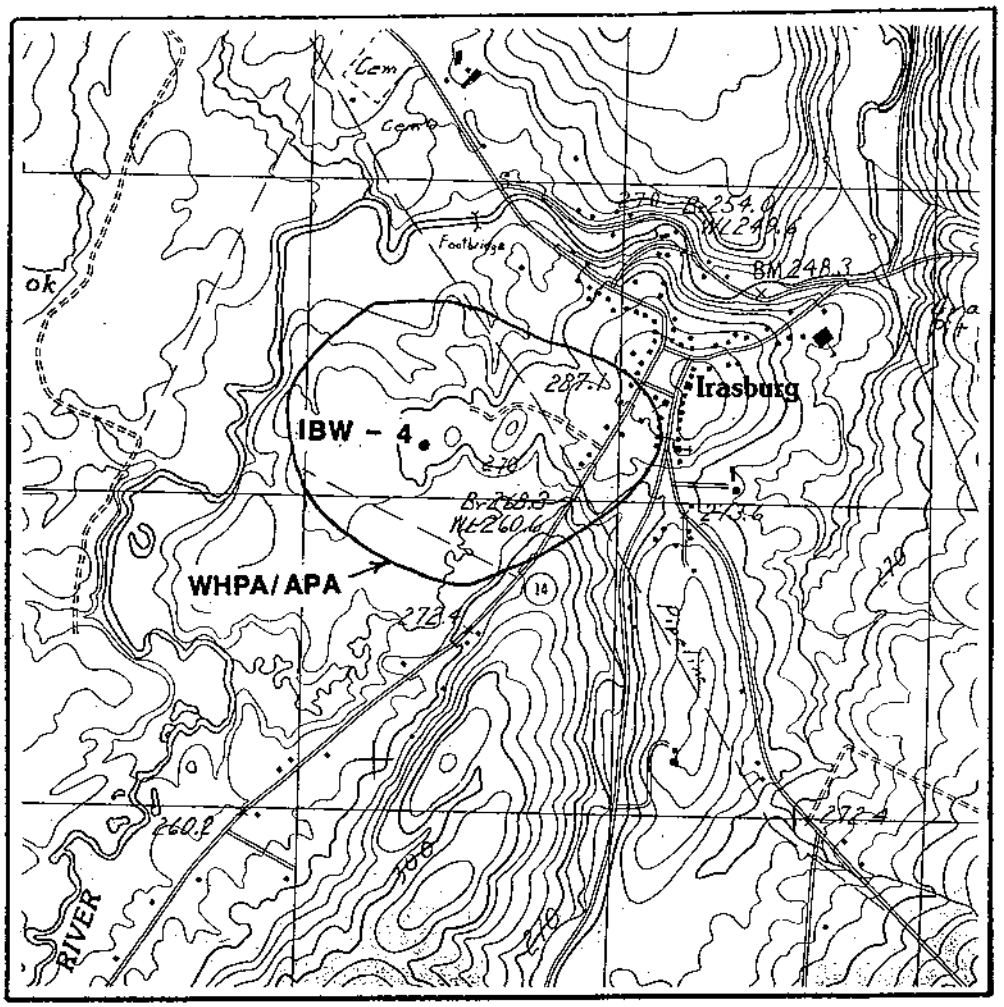


INSET (2)
IRASBURG

SCALE
0 0.1 0.2 MILES
0 0.1 0.2 KILOMETERS

SCALE
0.5 0 1 2 MILES
0.5 0 1 2 KILOMETERS

WHPA/APA Location Map



Source: U.S.G.S. 7.5 min. Topo. Series
Irasburg Quad.

Scale: 1" = 2000'

TABLES

Table 1

Project: Irasburg General Store Job # 9088

Location: Irasburg, Vermont Sheet # 1 of 4

Ground Water Elevation/Product Thickness Data (feet)

Data Point	TOC [2]	September 9-9-91	9-23-91	10-2-91	10-8-91	October 10-15-91	10-21-91	10-29-91
MW-1	94.89	87.84	89.64	89.99	90.54	90.27	90.06	88.89
MW-2	98.00	Dry@ 84.15	86.30	89.20	88.30	90.55	91.43	90.55
MW-3	95.10	75.00	79.35	0.13 81.65	0.05 83.00	0.07 83.83	0.26 84.15	1.01 82.09
MW-4	88.09	72.49	77.54	80.84	82.94	83.17	83.34	81.61
MW-5	[1] 100.00	88.44	91.15	92.03	92.70	93.07	93.35	92.05
OW-1	100.70	0.55 89.15	0.40 90.85	0.40 91.50	0.25 92.05	0.37 92.43	0.08 93.99	0.02 92.38
OW-2	99.03	87.58	89.78	90.43	91.13	91.48	91.83	90.53

Notes:

1) Elevation Datum Assumed

2) Reference Elevation is elevation of top of PVC well casing

Table 1

Project: Irasburg General Store Job # 9088

Location: Irasburg, Vermont Sheet # 2 of 4

Ground Water Elevation/Product Thickness Data (feet)

Data Point	TOC	November					December		
		11-4-91	11-13-91	11-18-91	11-26-91	12-7-91	12-13-91	12-16-91	12-23-91
MW-1	94.89	87.43	85.29	86.76	89.89	87.07	90.16	90.44	88.94
MW-2	98.00	90.30	89.64	89.28	88.85	89.55	89.78	90.05	90.20
MW-3	95.10	1.92 80.38	0.72 80.24	0.20 80.95	0.20 81.50	0.35 81.65	0.40 82.90	1.00 82.75	1.30 82.45
MW-4	88.00	80.47	80.06	81.05	82.10	80.05	82.62	IN	82.15
MW-5	100.00	91.76	91.07	91.00	91.62	91.50	92.03	90.75	92.30
MW-6	88.59		80.88	82.32	83.39	82.34	83.84	83.99	83.25
MW-7	85.97		80.52	81.57	82.35	82.45	82.67	82.88	81.42
MW-8	89.39		80.98	82.82	82.81	82.24	83.60	84.47	83.89
MW-9	91.43		82.01	0.02 82.31	0.62 82.71	0.45 82.98	0.49 83.88	0.48 84.13	0.31 84.22
MW-10	86.94		80.60	82.18	82.79	82.17	83.54	83.44	82.90
MW-11	88.40		78.65	82.10	83.00	81.95	83.27	83.80	82.74
AH-1	95.62		0.22 87.46	0.18 87.84	0.38 87.92	88.12	0.30 88.55	0.50 88.77	0.50 89.27
OW-1	100.70	0.02 92.08	0.01 91.53	91.40	92.10	91.60	92.70	92.22	91.90
OW-2	99.03	90.06	89.35	89.31	89.80	90.23	94.03	90.63	90.43

Notes:

1) Elevation Datum Assumed

2) Reference Elevation is elevation of top of PVC well casing

IN - Inaccessible

Table 1

Project: Irasburg General Store Job # 9088

Location: Irasburg, Vermont Sheet # 3 of 4

Ground Water Elevation/Product Thickness Data (feet)

Data Point	TOC	January 1-3-92	1-7-92	1-17-92	1-24-92	1-30-92	2-8-92	February 2-12-92	2-18-92	2-26-92
MW-1	94.89	85.69	84.77	88.29	87.39	87.59	81.64	81.69	81.39	84.79
MW-2	98.00	88.84	88.74	88.11	87.70	Iced	85.90	85.48	84.95	84.35
MW-3	95.10	0.48 80.60	1.63 79.43	1.36 81.03	2.10 78.80	2.80 77.05	3.50 74.30	1.50 74.90	1.05 74.35	1.30 74.90
MW-4	88.00	80.20	79.88	81.38	80.12	78.80	77.20	76.30	75.50	77.27
MW-5	100.00	90.45	90.02	89.27	88.90	88.35	86.90	86.10	85.30	85.25
MW-6	88.59	81.00	80.58	82.84	80.59	78.39	77.59	76.89	75.94	77.39
MW-7	85.97	80.65	80.29	81.91	79.97	79.22	77.37	76.62	75.97	78.17
MW-8	89.39	81.64	81.14	0.01 82.43	81.22	0.25 79.69	0.22 78.07	0.10 77.29	0.10 76.57	77.74
MW-9	91.43	0.35 82.22	0.56 81.56	0.23 81.73	0.48 81.03	0.80 79.63	0.50 78.28	0.05 78.23	0.12 79.16	78.03
MW-10	86.94	81.32	79.99	82.37	80.99	79.84	78.24	77.24	75.59	78.44
MW-11	88.40	80.95	79.44	81.85	80.55	79.45	77.75	76.90	76.15	78.95
AH-1	95.62	0.18 87.42	0.42 87.54	0.02 87.79	90.22	>.60 ---	87.32	>.30 ---	>.38 <87.42	Dry@ 87.32
OW-1	100.70	90.57	90.42	89.64	89.08	88.53	87.80	87.75	88.15	87.95
OW-2	99.03	88.63	88.38	Frozen	87.57	86.43	86.63	86.30	86.16	86.03
RW-1	90.88	82.12	---	82.82	0.25 80.08	0.01 80.32	78.68	79.38	79.68	77.08

Notes:

1) Elevation Datum Assumed

2) Reference Elevation is elevation of top of PVC well casing

IN - Inaccessible

Table 1

Project: Irasburg General Store Job # 9088

Location: Irasburg, Vermont Sheet # 4 of 4

Ground Water Elevation/Product Thickness Data (feet)

Data Point	TOC	March 3-5-92	March 3-10-92	March 3-19-92	March 3-25-92	April 4-1-92			
MW-1	94.89	84.18	84.19	88.74	85.49	89.69			
MW-2	98.00	84.17	84.20	Iced	86.44	87.40			
MW-3	95.10	0.80 74.55	0.74 75.31	0.95 77.25	0.76 76.59	0.60 78.32			
MW-4	88.00	77.30	77.59	79.05	78.49	79.64			
MW-5	100.00	85.26	85.55	86.34	86.47	87.35			
MW-6	88.59	76.49	77.91	80.03	78.58	80.74			
MW-7	85.97	77.92	77.87	81.18	78.75	80.12			
MW-8	89.39	77.45	78.24	79.15	78.36	79.64			
MW-9	91.43	0.01 78.18	78.13	Iced	78.52	0.20 79.66			
MW-10	86.94	78.43	78.74	80.44	78.94	78.44			
MW-11	88.40	78.93	79.05	81.40	79.70	79.04			
AH-1	95.62	Dry @ 87.32	Dry @ 87.32	Dry	87.35	Dry @ 87.32			
OW-1	100.70	87.94	88.10	88.51	Dry @ 88.18	88.69			
OW-2	99.03	86.26	86.32	86.14	86.89	87.66			
RW-1	90.88	75.04	74.98	0.01 76.58	76.93	75.03			

Notes:

1) Elevation Datum Assumed

2) Reference Elevation is elevation of top of PVC well casing

IN - Inaccessible

Table 2

Project: Irasburg General Store Job # 9088

Location: Irasburg, Vermont Sheet # 1 of 4

HNU Photoionization Readings (PID) (ppm)

Data Point	September		October					
	9-9-91	9-23-91	10-2-91	10-8-91	10-15-91	10-21-91	10-29-91	
MW-1	1.0	0.4	BG	0.4	BG	BG	BG	
MW-2	1.0	1.0	5.0	1.2	10.0	BG	1.0	
MW-3	22	SL	SL	SL	SL	SL	SL	
MW-4	1.0	0.2	1.0	60	26	10.0	38	
MW-5	2.2	60	48	8.2	6.2	22	4.4	
MW-6								
MW-7								
MW-8								
MW-9								
MW-10								
MW-11								
AH-1								
OW-1	3.8	110	150	70	SL	100	150	
OW-2	30	SL	SL	22	130	48	4.0	
Basement	BG	BG	BG	BG	BG	0.2	BG	
Storm Sewer	BG	BG	BG	BG	BG	BG	BG	

Notes: BG - Background

SL - Saturated Lamp

Table 2

Project: Irasburg General Store Job # 9088

Location: Irasburg, Vermont Sheet # 2 of 4

HNU Photoionization Readings (PID) (ppm)

Data Point	November				December			
	11-4-91	11-13-91	11-18-91	11-26-91	12-7-91	12-13-91	12-16-91	12-23-91
MW-1	BG	BG	BG	BG	BG	BG	BG	BG
MW-2	15.4	5.0	3.0	2.0	BG	0.4	0.4	BG
MW-3	SL	100	SL	120	SL	SL	120	SL
MW-4	52	0.2	42.0	50	20.0	70	IN	20.0
MW-5	36	13.2	15.0	10.0	BG	3.2	2.4	4.0
MW-6		BG	0.6	BG	BG	BG	BG	BG
MW-7		BG	0.8	1.0	BG	1.8	0.2	BG
MW-8		42	SL	100	50	80	SL	160
MW-9		102	32	50	140	SL	SL	SL
MW-10		0.4	8.4	2.8	BG	BG	0.4	1.2
MW-11		0.4	2.6	1.0	BG	BG	BG	BG
AH-1		SL	96	100	SL	120	170	SL
OW-1	150	160	SL	SL	SL	20	SL	116
OW-2	4.6	0.8	10.0	20.0	10.0	70	4.6	15.0
Basement	BG	1.8	0.4	2.0		BG	BG	BG
Storm Sewer	BG	BG	BG	BG		BG	BG	BG

Notes: BG - Background

SL - Saturated Lamp

IN - Inaccessible

Table 2

Project: Irasburg General Store Job # 9088

Location: Irasburg, Vermont Sheet # 3 of 4

HNU Photoionization Readings (PID) (ppm)

Data Point	January					February			
	1-3-92	1-7-92	1-17-92	1-24-92	1-30-92	2-8-92	2-12-92	2-18-92	2-26-92
MW-1	BG	BG	BG	BG	BG	BG	BG	BG	BG
MW-2	0.4	BG	BG	32	BG	2.0	BG	BG	BG
MW-3	SL	150	SL	150	SL	SL	SL	160	SL
MW-4	9.0	9.4	3.6	20.0	0.6	BG	7.0	5.8	4.0
MW-5	2.0	3.0	1.2	50	3.0	0.8	20.0	BG	4.0
MW-6	BG	BG	BG	BG	BG	BG	BG	BG	BG
MW-7	0.4	BG	BG	BG	BG	BG	BG	1.0	BG
MW-8	SL	70	26	SL	30	20.0	150	36	SL
MW-9	SL	80	30	110	SL	SL	50	140	SL
MW-10	0.4	BG	BG	3.0	0.2	BG	BG	BG	BG
MW-11	BG	BG	BG	3.6	BG	BG	BG	BG	1.4
AH-1	SL	10.0	SL	SL	SL	50	SL	SL	SL
OW-1	SL	200	120	60	110	80	SL	380	200
OW-2	22	15.0	---	400	SL	10.0	4.0	20.0	90
RW-1	---	40	---	68	20.0	70	30	15.0	1.0
Basement	2.0	BG	BG	BG	5.0	BG	BG	1.0	BG
Storm Sewer	0.2	BG	BG	BG	0.2	BG	BG	BG	BG

Notes: BG - Background

SL - Saturated Lamp

IN - Inaccessible

Table 2

Project: Irasburg General Store Job # 9088

Location: Irasburg, Vermont Sheet # 4 of 4

HNU Photoionization Readings (PID) (ppm)

Data Point	March				April			
	3-5-92	3-10-92	3-19-92	3-25-92	4-1-92			
MW-1	BG	BG	BG	BG	BG			
MW-2	BG	BG	IN	BG	2.0			
MW-3	SL	SL	SL	SL	80			
MW-4	3.0	0.8	BG	BG	2.0			
MW-5	3.8	5.8	1.4	BG	1.2			
MW-6	BG	BG	BG	BG	BG			
MW-7	BG	BG	BG	BG	BG			
MW-8	20.0	40	SL	SL	28			
MW-9	SL	SL	IN	24	SL			
MW-10	BG	BG	BG	BG	BG			
MW-11	BG	BG	BG	BG	BG			
AH-1	SL	SL	SL	150	SL			
OW-1	92	110	SL	SL	10.2			
OW-2	90	82	30	0.6	68			
RW-1	1.2	3.0	2.6	20.0	2.0			
IGS Basement	0.2	0.4	7.0	BG	BG			
Poginy Basement	IN	IN	BG	BG	BG			
Storm Sewer	BG	BG	BG	3.2	BG			

Notes: BG - Background

SL - Saturated Lamp

IN - Inaccessible

Table 3

Project: Irasburg General Store Job # 9088

Location: Irasburg, Vermont Sheet # 1 of 1

Contaminant Concentrations - BTEX & MTBE (ppb)

Data Point	9-9-91	12-13-91	2-6-92	2-17-92	3-5-92	3-18-92	
MW-1	ND / ND	ND / ND					
MW-2	Dry / Dry	4.88 / 2.37					
MW-3	ND / 50,100	FP / FP					
MW-4	ND / ND	ND / 8.66					
MW-5	ND / ND	ND / 7.72					
MW-6		ND / ND					
MW-7		ND / ND					
MW-8		ND / 39,110					
MW-9		FP / FP					
MW-10		1.94 / ND					
MW-11		ND / ND					
AH-1	FP / FP	--- / ---					
OW-1	FP / FP	FP / FP					
OW-2	ND / 4,451	ND / 17.36					
RW-1			ND / 6,346	ND / 7,247	ND / 3,117	ND / 2,908	

Notes: ND - None Detected

FP - Free Product

MTBE / Total BTEX

Table 4

Project: Irasburg General Store Job # 9088

Location: Irasburg, Vermont Sheet # 1 of 1

Ambient Indoor Air Benzene Concentrations (ppb)

Data Point	12-31-91							
General Store Sales Area	3.6							
General Store Smith Residence	2.2 *							
General Store 2nd FloorApt.	3.9							
Poginy Residence	1.1							

Notes: * - Average of Duplicate Samples

APPENDICES

APPENDIX A

Monitoring Well Logs

IRASBURG GENERAL STORE

WELL LOGS

WELL: MW-1

DRILLER: S.B. Collins, Inc.

GEOLOGIST: Steven LaRosa, Lincoln Applied Geology, Inc.

DATE: September 3, 1991

SOILS DESCRIPTION:

Depth	Description	HNU
0 - 16'	Light brown fine sandy silts with some pebbles. Till derived. Saturated at 7', very hard at 15'	BG

WELL CONSTRUCTION:

Bottom of Boring: 14'

Well Screen: 10', .020" slot 2 inch sch. 40 PVC

Solid Riser: 3' Solid 2 inch sch. 40 PVC

Sand Pack: 14' to 3'

Bentonite Seal: 3' to 1.5'

IRASBURG GENERAL STORE

WELL LOGS

WELL: MW-2

DRILLER: Tri-State Drilling

GEOLOGIST: Steven LaRosa, Lincoln Applied Geology, Inc.

DATE: September 5, 1991

SOILS DESCRIPTION:

Depth	Description	HNU
0 - 7'	Sandy, rocky fill	BG
7 - 12.5'	Light brown fine sandy silts with some pebbles. Till derived. Very moist at 12'	BG
12.5 - 15.5'	Dark and olive-brown till. Very dense, few pebbles past 14'	BG

WELL CONSTRUCTION:

Bottom of Boring: 13.5'

Well Screen: 10', .010" slot 2 inch sch. 40 PVC

Solid Riser: 3.5' Solid 2 inch sch. 40 PVC

Sand Pack: 13.5' to 3'

Bentonite Seal: 3' to 2'

IRASBURG GENERAL STORE

WELL LOGS

WELL: MW-3

DRILLER: Tri-State Drilling

GEOLOGIST: Steven LaRosa, Lincoln Applied Geology, Inc.

DATE: September 5, 1991

SOILS DESCRIPTION:

Depth	Description	HNU
0 - 5'	Gravel fill	BG
5 - 12'	Moist brown silty fine sands	7'- BG 10'-50 ppm
12 - 19'	Dark brown and olive till with fine sand lenses at 14.5' and 14.75'	350 ppm
19 - 21.5'	Saturated brown and olive silty fine sand	20 ppm
21.5 - 27'	Dense till with silty fine sand lenses up to .75' thick. Drier than above.	1-5 ppm

WELL CONSTRUCTION:

Bottom of Boring: 27'

Well Screen: 15', .010" slot 2 inch sch. 40 PVC

Solid Riser: 7.5' Solid 2 inch sch. 40 PVC

Sand Pack: 25' to 5.5'

Bentonite Seal: 5.5' to 4.5'

IRASBURG GENERAL STORE

WELL LOGS

WELL: MW-4

DRILLER: Tri-State Drilling

GEOLOGIST: Steven LaRosa, Lincoln Applied Geology, Inc.

DATE: September 5, 1991

SOILS DESCRIPTION:

Depth	Description	HNU
0 - .5'	Topsoil	
.5 - 5'	Sandy loam	
5 - 10'	Light brown silty fine sands. Till derived. Moister and siltier with depth	BG
10 - 12'	Rocky, dry till	1-2 ppm
12 - 15'	Interbedded moist fine sands and rocky till	BG
15 - 21'	Brown very fine sandy silts with thin lenses of clay and saturated fine sands.	BG
21 - 22'	Dense till	

WELL CONSTRUCTION:

Bottom of Boring: 20'

Well Screen: 10', .010" slot 2 inch sch. 40 PVC

Solid Riser: 10' Solid 2 inch sch. 40 PVC

Sand Pack: 20' to 7.8'

Bentonite Seal: 7.8' to 6.8'

IRASBURG GENERAL STORE

WELL LOGS

WELL: MW-5

DRILLER: Tri-State Drilling

GEOLOGIST: Steven LaRosa, Lincoln Applied Geology, Inc.

DATE: September 5, 1991

SOILS DESCRIPTION:

Depth	Description	HNU
0 - 12.5'	Moist dark brown and olive very fine sandy silts with some clay. Moist and sticky.	BG
12.5 - 20'	Interbedded dense dark brown and olive till and saturated very fine sands. Beds .25 to .75' thick.	BG

WELL CONSTRUCTION:

Bottom of Boring: 20.0'

Well Screen: 10', .010" slot 2 inch sch. 40 PVC

Solid Riser: 10' Solid 2 inch sch. 40 PVC

Sand Pack: 20' to 8'

Bentonite Seal: 8' to 6'

IRASBURG GENERAL STORE

WELL LOGS

WELL: MW-6

DRILLER: Tri-State Drilling

GEOLOGIST: Steven LaRosa, Lincoln Applied Geology, Inc.

DATE: November 12, 1991

SOILS DESCRIPTION

Depth	Description	HNU
0 - .5'	Topsoil	
.5 - 5'	Light brown silty very fine sands.	
5 - 12'	Olive and light brown silty very fine sands. Till derived, interbedded fine to medium sand lenses. Increased clay content with depth, saturated at 11'.	BG
12 - 15'	Light brown silt with some clay and very fine sand. Very loose and saturated.	BG

WELL CONSTRUCTION

Bottom of Boring: 15'

Well Screen: 10', 0.010" slot 2" PVC sch 40

Solid Riser: 5', 2" PVC sch 40

Sand Pack: 15' to 3'

Bentonite Seal: 3' to 1'

IRASBURG GENERAL STORE

WELL LOGS

WELL: MW-7

DRILLER: Tri-State Drilling

GEOLOGIST: Steven LaRosa, Lincoln Applied Geology, Inc.

DATE: November 12, 1991

SOILS DESCRIPTION

Depth	Description	HNU
0 - .5'	Topsoil	
.5 - 5'	Very fine sandy silt.	BG
5 - 14'	Silty very fine sand.	BG

WELL CONSTRUCTION

Bottom of Boring: 14'

Well Screen: 10', 0.010" slot 2" PVC sch 40

Solid Riser: 4', 2" PVC sch 40

Sand Pack: 14' to 2.5'

Bentonite Seal: 2.5' to 1'

IRASBURG GENERAL STORE

WELL LOGS

WELL: MW-8

DRILLER: Tri-State Drilling

GEOLOGIST: Steven LaRosa, Lincoln Applied Geology, Inc.

DATE: November 12, 1991

SOILS DESCRIPTION

Depth	Description	HNU
0 - .5'	Topsoil	
.5 - 15'	Silty, very fine sands with little till.	5' - Saturated Lamp (SL) 10' - 220 ppm
15 - 17'	Dry olive-brown hard till.	10 ppm

WELL CONSTRUCTION

Bottom of Boring: 15'

Well Screen: 10', 0.010" slot 2" PVC sch 40

Solid Riser: 5', 2" PVC sch 40

Sand Pack: 15' to 3'

Bentonite Seal: 3' to 1.5'

IRASBURG GENERAL STORE

WELL LOGS

WELL: MW-9

DRILLER: Tri-State Drilling

GEOLOGIST: Steven LaRosa, Lincoln Applied Geology, Inc.

DATE: November 12, 1991

SOILS DESCRIPTION

Depth	Description	HNU
0 - .5'	Topsoil	
.5 -15'	Silty very fine sands. Saturated at 7'.	5' - SL 10' - 175 ppm

WELL CONSTRUCTION

Bottom of Boring: 15'

Well Screen: 13', 0.010" slot 2" PVC sch 40

Solid Riser: 2', 2" PVC sch 40

Sand Pack: 15' to 1.5'

Bentonite Seal: 1.5' to 1'

IRASBURG GENERAL STORE

WELL LOGS

WELL: MW-10

DRILLER: Tri-State Drilling

GEOLOGIST: Steven LaRosa, Lincoln Applied Geology, Inc.

DATE: November 13, 1991

SOILS DESCRIPTION

Depth	Description	HNU
0 - .5'	Topsoil	
.5 - 5'	Very fine sandy silt. Moist at 5'.	BG
5 - 10'	Sticky brown clayey silt.	BG
10 - 13'	Saturated very fine sands.	BG

WELL CONSTRUCTION

Bottom of Boring: 13'

Well Screen: 10', 0.010" slot 2" PVC sch 40

Solid Riser: 3', 2" PVC sch 40

Sand Pack: 13' to 2.5'

Bentonite Seal: 2.5' to 1'

IRASBURG GENERAL STORE

WELL LOGS

WELL: MW-11

DRILLER: Tri-State Drilling

GEOLOGIST: Steven LaRosa, Lincoln Applied Geology, Inc.

DATE: November 13 1991

SOILS DESCRIPTION

Depth	Description	HNU
0 - 1'	Topsoil	
1 - 10.5'	Till derived silty, very fine sand with little clay. Rocky at 7', very moist.	BG
10.5 - 14'	Denser with fine sands with less silt.	BG

WELL CONSTRUCTION

Bottom of Boring: 14'

Well Screen: 10', 0.010" slot 2" PVC sch 40

Solid Riser: 4', 2" PVC sch 40

Sand Pack: 14' to 3'

Bentonite Seal: 3' to 1'

SOIL PROBE LOG

TRI STATE
DRILLING & BORING, INC.
RFD #2, Box 113 West Burke, VT 05871
(802) 467-3123

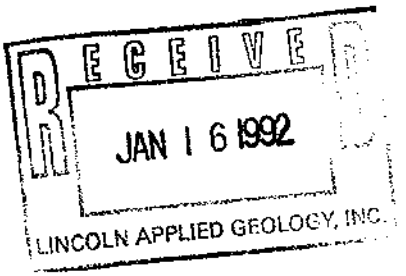
Page_1_
Monitor Well #1
* S.B. Collins
Irasburg General
Store

6" recovery well

		SAMPLER	SOIL
		Continuous	Saturated
TYPE	HSA		Wet
SIZE	4 1/4" & 6	5/8"	Moist
HAMMER	140#		Damp
FALL	30"		Slightly Damp

DATE STARTED:12/30/91 DATE COMPLETED:12/30/91

FOOTAGE DEPTH	BLOW COUNTS 6" 12" 18" 24"	REC	SOIL	DRILLER'S NOTES & COMMENTS
				Augered with 4 1/4" augers to 25'.
				Refusal at 25'.
				Pulled and redrilled with 6 5/8" augers.
				Pulled and set 6" pvc 20 slot screen to 21'6".



* Screen 21'6" to 1'6".
Sand to 1'6".
Betonite to 6".
Fill to surface.

Client: S.B. Colling, Inc.

Job Location: Irasburg Vermont

Engineer: Lincoln Applied Geology

Inspector: Steve LaRosa.

Driller: Neal Faulkner

Helper: Edward Westover

Materials:20' screen, 5' riser, 1 caps, 6 sand, 1 betonite.

APPENDIX B

Free Product Identification Results

aquatec
A Member of the Inchcape Environmental Group
55 South Park Drive, Colchester, Vermont 05446
TEL. 802/655-1203 FAX 802/655-1248

ANALYTICAL REPORT

Lincoln Applied Geology
RD 1, Box 710
Bristol, VT 05443

Date : 10/29/91
ETR Number : 28562
Project No.: 91000
No. Samples: 1
Arrived : 10/04/91

Attention : Steve La Rosa

Job:Irasburg Bus Barn

Standard analyses were performed in accordance with Methods for Analysis of Water and Wastes, EPA-600/4/79-020, Test Methods for Evaluating Solid Waste, SW-846, or Standard Methods for the Examination of Water and Wastewater. All results are in mg/l unless otherwise noted.

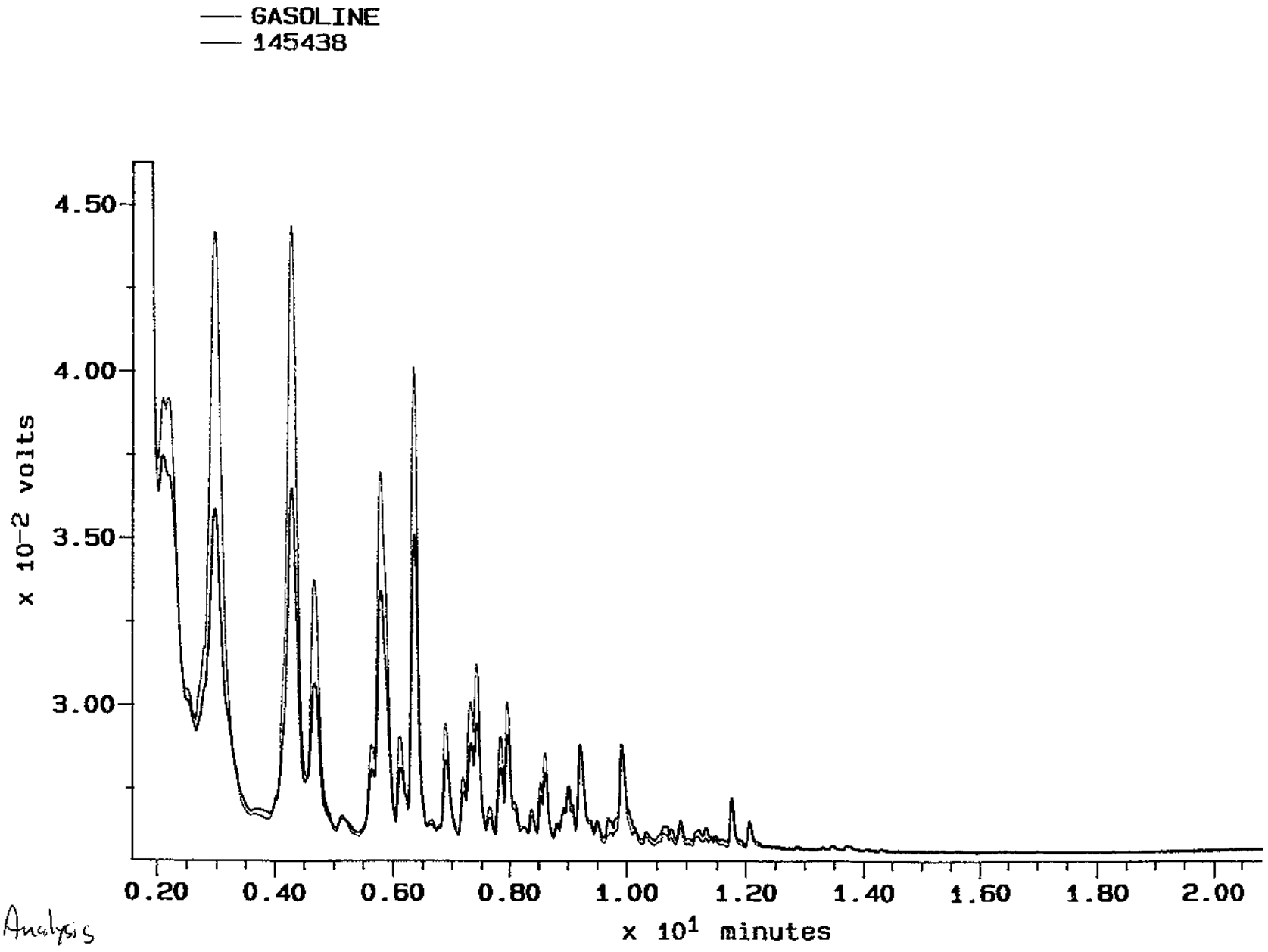
Lab No./ Method No.	Sample Description/ Parameter	Result
145438	OW-1:10/03/91 @0745	
OR366	Fuel Oil Fingerprint	NOTE1

Comments/Notes

NOTE1: The sample has an excellent chromatagraphic pattern match with gasoline.

< Last Page > Submitted By : Aquatec Inc.

R. Mann McKeen



Direct Injection Analysis

aquatec
A Member of the Inchcape Environmental Group
55 South Park Drive, Colchester, Vermont 05446
TEL. 802/655-1203 FAX 802/655-1248

ANALYTICAL REPORT

Lincoln Applied Geology
RD 1, Box 710
Bristol, VT 05443

Date : 10/29/91
ETR Number : 28563
Project No.: 91000
No. Samples: 1
Arrived : 10/08/91

Attention : Steve La Rosa

Job:Irasburg Gen. Store

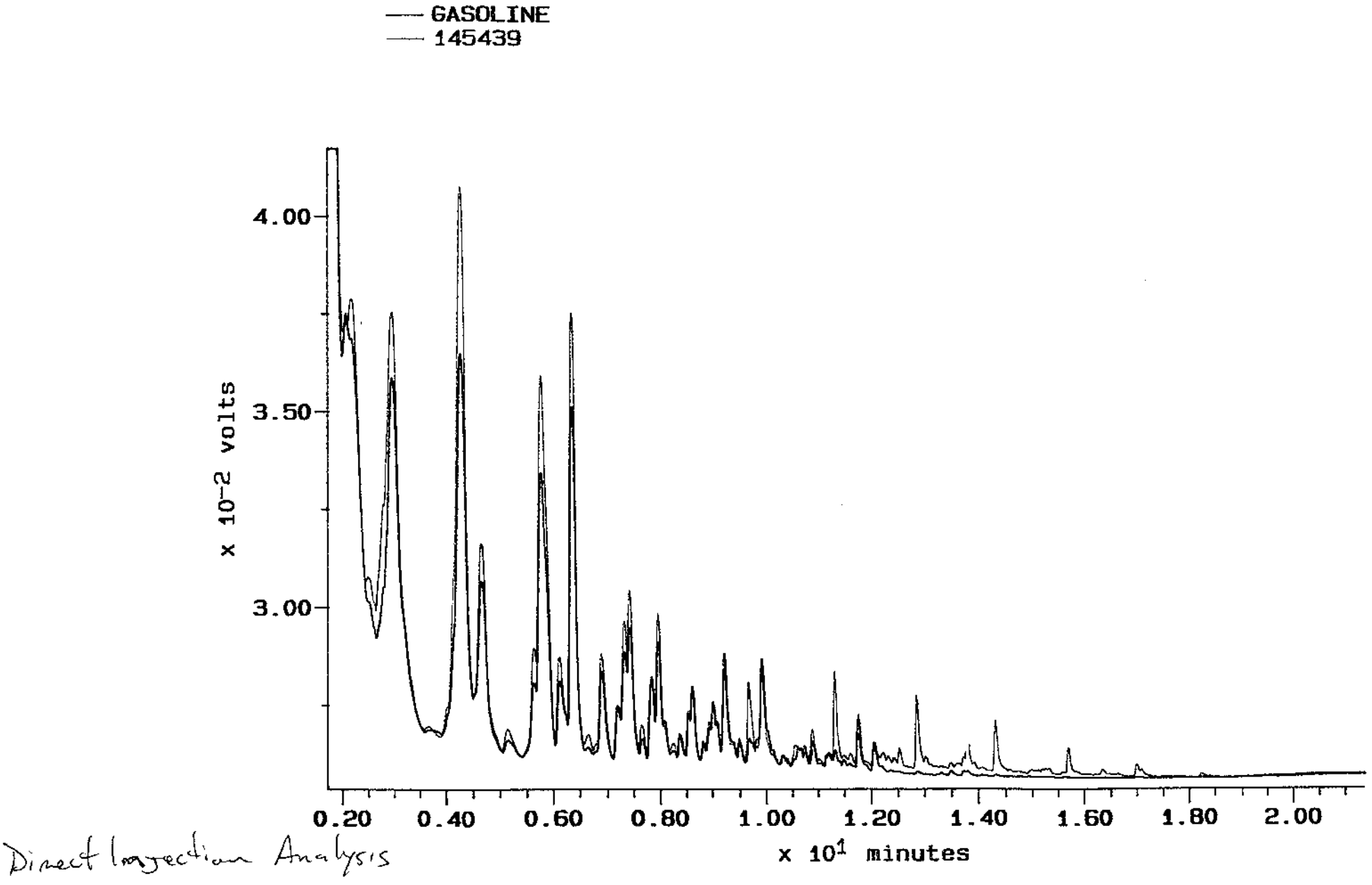
Standard analyses were performed in accordance with Methods for Analysis of Water and Wastes, EPA-600/4/79-020, Test Methods for Evaluating Solid Waste, SW-846, or Standard Methods for the Examination of Water and Wastewater.
All results are in mg/l unless otherwise noted.

Lab No./ Method No.	Sample Description/ Parameter	Result
145439	MW-3:10/04/91 @1155	
OR366	Fuel Oil Fingerprint	NOTE1

Comments/Notes

NOTE1: The sample has a good chromatagraphic match with gasoliine.

< Last Page > Submitted By : Aquatec Inc.



Direct Injection Analysis

APPENDIX C

Chemical Ground Water Quality Results

Monitoring Well Results
For
September 9, 1991

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

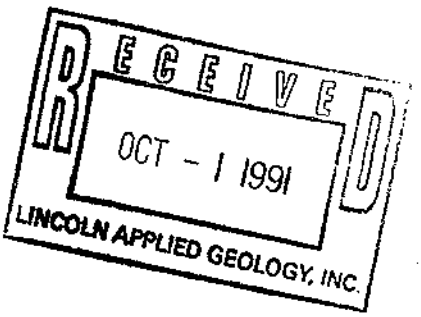
LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Irasburg General Store
REPORT DATE: September 30, 1991 ANALYSIS DATE:September 18, 1991
SAMPLER: J. Holman STATION: MW #1
DATE SAMPLED: September 9, 1991 REF.#: 23,553
DATE RECEIVED:September 10, 1991 TIME SAMPLED: 5:20 p.m.

Parameter	Concentration (ug/L)
Benzene	ND [1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0



NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

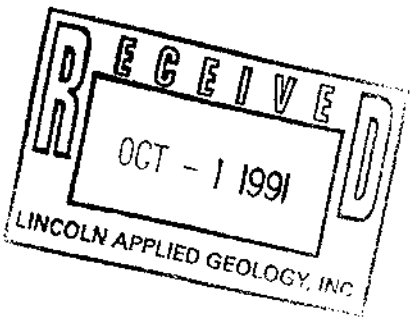
LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Irasburg General Store
REPORT DATE: September 30, 1991 ANALYSIS DATE:September 18, 1991
SAMPLER: J. Holman STATION: MW #3
DATE SAMPLED: September 9, 1991 REF.#: 23,554
DATE RECEIVED:September 10, 1991 TIME SAMPLED: 5:20 p.m.

Parameter	Concentration (ug/L)
Benzene	10,400.
Toluene	26,700.
Ethylbenzene	1,300.
Xylenes	11,700.
MTBE	ND[1]

NUMBER OF UNIDENTIFIED PEAKS FOUND: 6



NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

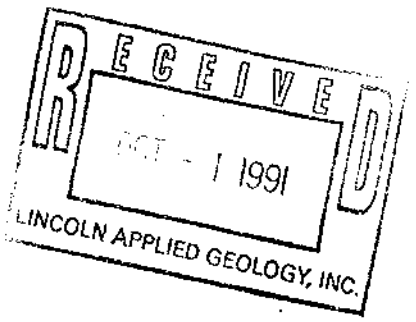
32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Irasburg General Store
REPORT DATE: September 30, 1991 ANALYSIS DATE:September 18, 1991
SAMPLER: J. Holman STATION: MW #4
DATE SAMPLED: September 9, 1991 REF.#: 23,555
DATE RECEIVED:September 10, 1991 TIME SAMPLED: 5:20 p.m.

Parameter	Concentration (ug/L)
Benzene	ND [1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND



NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

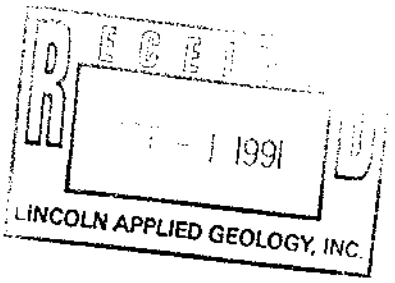
LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Irasburg General Store
REPORT DATE: September 30, 1991 ANALYSIS DATE:September 18, 1991
SAMPLER: J. Holman STATION: MW #5
DATE SAMPLED: September 9, 1991 REF.#: 23,556
DATE RECEIVED:September 10, 1991 TIME SAMPLED: 5:20 p.m.

Parameter	Concentration (ug/L)
Benzene	ND [1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0



NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

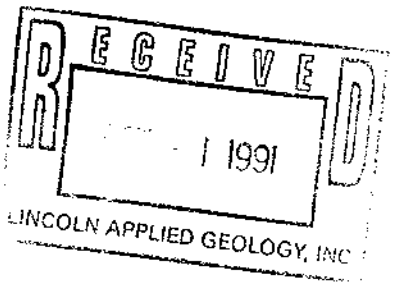
32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Irasburg General Store
REPORT DATE: September 30, 1991 ANALYSIS DATE:September 18, 1991
SAMPLER: J. Holman STATION: OW #2
DATE SAMPLED: September 9, 1991 REF.#: 23,557
DATE RECEIVED:September 10, 1991 TIME SAMPLED: 5:20 p.m.

Parameter	Concentration (ug/L)
Benzene	1,230.
Toluene	1,200.
Ethylbenzene	311.
Xylenes	1,710.
MTBE	ND[1]



NUMBER OF UNIDENTIFIED PEAKS FOUND: 4

NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

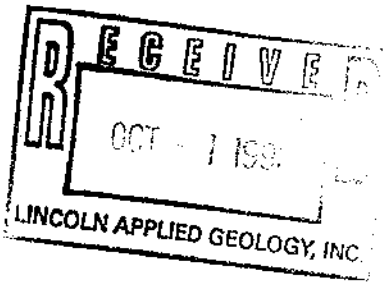
LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Irasburg General Store
REPORT DATE: September 30, 1991 ANALYSIS DATE:September 18, 1991
SAMPLER: J. Holman STATION: Trip Blank
DATE SAMPLED: September 9, 1991 REF.#: 23,558
DATE RECEIVED:September 10, 1991 TIME SAMPLED: 5:20 p.m.

Parameter	Concentration (ug/L)
Benzene	ND [1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0



NOTES:

1 Compound not detected in analysis

Reviewed by _____

Monitoring Well Results
For
December 13, 1991

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

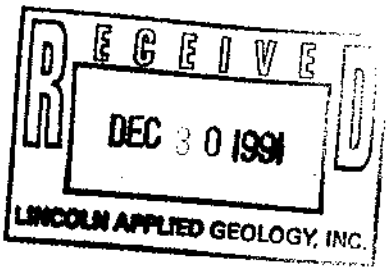
GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: L.A.G.
PROJECT NAME: Irasburg General Store
REPORT DATE: December 27, 1991
SAMPLER: Jim Holman
DATE SAMPLED: December 13, 1991
DATE RECEIVED: December 13, 1991

ANALYSIS DATE: December 26, 1991
STATION: MW 1
REF.#: 26,917
TIME SAMPLED: 11:25

Parameter	Concentration (ug/L)
Benzene	ND[1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0



NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

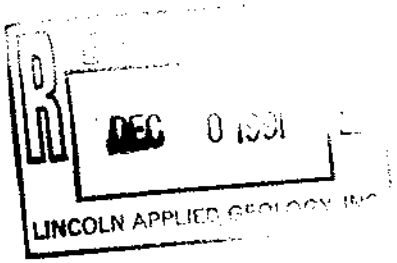
GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: L.A.G.
PROJECT NAME: Irasburg General Store
REPORT DATE: December 27, 1991
SAMPLER: Jim Holman
DATE SAMPLED: December 13, 1991
DATE RECEIVED: December 13, 1991

ANALYSIS DATE: December 26, 1991
STATION: MW 2
REF.#: 26,918
TIME SAMPLED: 11:35

Parameter	Concentration (ug/L)
Benzene	ND[1]
Toluene	2.37
Ethylbenzene	ND
Xylenes	ND
MTBE	4.88

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0



NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

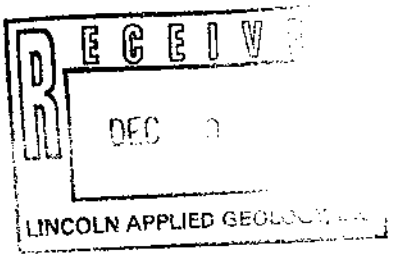
GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: L.A.G.
PROJECT NAME: Irasburg General Store
REPORT DATE: December 27, 1991
SAMPLER: Jim Holman
DATE SAMPLED: December 13, 1991
DATE RECEIVED: December 13, 1991

ANALYSIS DATE: December 26, 1991
STATION: MW 4
REF.#: 26,919
TIME SAMPLED: 10:55

Parameter	Concentration (ug/L)
Benzene	ND[1]
Toluene	1.88
Ethylbenzene	ND
Xylenes	6.78
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0



NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: L.A.G.
PROJECT NAME: Irasburg General Store
REPORT DATE: December 27, 1991
SAMPLER: Jim Holman
DATE SAMPLED: December 13, 1991
DATE RECEIVED: December 13, 1991

ANALYSIS DATE: December 26, 1991
STATION: MW 5
REF.#: 26,920
TIME SAMPLED: 11:45

Parameter	Concentration (ug/L)
Benzene	ND[1]
Toluene	TBQ[2]
Ethylbenzene	1.79
Xylenes	5.93
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 Compound not detected in analysis
2 Trace below quantitation limits

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

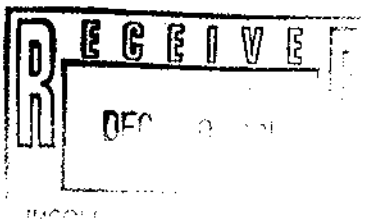
GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: L.A.G.
PROJECT NAME: Irasburg General Store
REPORT DATE: December 27, 1991
SAMPLER: Jim Holman
DATE SAMPLED: December 13, 1991
DATE RECEIVED: December 13, 1991

ANALYSIS DATE: December 26, 1991
STATION: MW 6
REF.#: 26,921
TIME SAMPLED: 11:15

Parameter	Concentration (ug/L)
Benzene	ND[1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0



NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

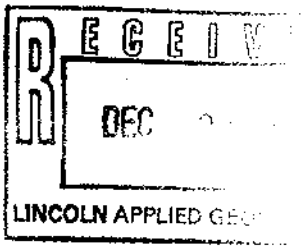
GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: L.A.G.
PROJECT NAME: Irasburg General Store
REPORT DATE: December 27, 1991
SAMPLER: Jim Holman
DATE SAMPLED: December 13, 1991
DATE RECEIVED: December 13, 1991

ANALYSIS DATE: December 26, 1991
STATION: MW 7
REF.#: 26,922
TIME SAMPLED: 11:10

Parameter	Concentration (ug/L)
Benzene	ND[1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0



NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

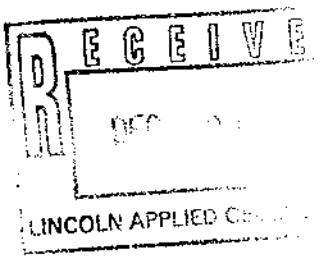
GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: L.A.G.
PROJECT NAME: Irasburg General Store
REPORT DATE: December 27, 1991
SAMPLER: Jim Holman
DATE SAMPLED: December 13, 1991
DATE RECEIVED: December 13, 1991

ANALYSIS DATE: December 26, 1991
STATION: MW 8
REF.#: 26,923
TIME SAMPLED: 11:50

Parameter	Concentration (ug/L)
Benzene	2,320.
Toluene	18,600.
Ethylbenzene	3,090.
Xylenes	15,100.
MTBE	ND[1]

NUMBER OF UNIDENTIFIED PEAKS FOUND: 15



NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: L.A.G.
PROJECT NAME: Irasburg General Store
REPORT DATE: December 27, 1991
SAMPLER: Jim Holman
DATE SAMPLED: December 13, 1991
DATE RECEIVED: December 13, 1991

ANALYSIS DATE: December 26, 1991
STATION: MW 10
REF.#: 26,924
TIME SAMPLED: 10:20

Parameter	Concentration (ug/L)
Benzene	ND[1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	1.94

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: L.A.G.
PROJECT NAME: Irasburg General Store
REPORT DATE: December 27, 1991
SAMPLER: Jim Holman
DATE SAMPLED: December 13, 1991
DATE RECEIVED: December 13, 1991

ANALYSIS DATE: December 26, 1991
STATION: MW 11
REF.#: 26,925
TIME SAMPLED: 10:35

Parameter	Concentration (ug/L)
Benzene	ND[1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: L.A.G.
PROJECT NAME: Irasburg General Store
REPORT DATE: December 27, 1991
SAMPLER: Jim Holman
DATE SAMPLED: December 13, 1991
DATE RECEIVED: December 13, 1991

ANALYSIS DATE: December 26, 1991
STATION: OW 2
REF.#: 26,926
TIME SAMPLED: 12:10

Parameter	Concentration (ug/L)
Benzene	TBQ[2]
Toluene	3.26
Ethylbenzene	ND[1]
Xylenes	14.1
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 8

NOTES:

1 Compound not detected in analysis
2 Trace below quantitation limits

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: L.A.G.
PROJECT NAME: Irasburg General Store
REPORT DATE: December 27, 1991
SAMPLER: Jim Holman
DATE SAMPLED: December 13, 1991
DATE RECEIVED: December 13, 1991

ANALYSIS DATE: December 26, 1991
STATION: Trip Blank
REF.#: 26,927
TIME SAMPLED: 6:30 a.m.

Parameter	Concentration (ug/L)
Benzene	ND[1]
Toluene	ND
Ethylbenzene	ND
Xylenes	ND
MTBE	ND

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 Compound not detected in analysis

Reviewed by _____

Ground Water Treatment System
Influent Results

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins
PROJECT NAME: Irasburg General Store
REPORT DATE: March 30, 1992
DATE SAMPLED: March 18, 1992
DATE RECEIVED: March 18, 1992
ANALYSIS DATE: March 30, 1992

PROJECT CODE: SBIR7104
REF.#: 29,088
STATION: Input Can #1
TIME SAMPLED: 1:00
SAMPLER: Carl Ruprecht

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)
Benzene	10	438.
Toluene	10	1,640.
Ethylbenzene	10	35.1
Xylenes	10	795.
MTBE	10	ND[2]

NUMBER OF UNIDENTIFIED PEAKS FOUND: 11

NOTES:

1 Detection limit raised due to high levels of contaminants. Sample run at 10% dilution.

2 None detected

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: S.B. Collins
PROJECT NAME: Irasburg General Store
REPORT DATE: March 20, 1992
SAMPLER: Carl Ruprecht
DATE SAMPLED: March 5, 1992
DATE RECEIVED: March 6, 1992

PROJECT CODE: SBIG7182
ANALYSIS DATE: March 14, 1992
STATION: Input Can 1
REF.#: 28,710
TIME SAMPLED: 1:00

Parameter	Concentration (ug/L)
Benzene	627.
Toluene	1,780.
Ethylbenzene	27.4
Xylenes	683.
MTBE	ND[1]

NUMBER OF UNIDENTIFIED PEAKS FOUND: 14

NOTES:

1 Compound not detected in analysis

Reviewed by _____

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: S.B. Collins
PROJECT NAME: Irasburg General Store
REPORT DATE: March 4, 1992
SAMPLER: Carl Ruprecht
DATE SAMPLED: February 17, 1992
DATE RECEIVED: February 18, 1992

PROJECT CODE: SBIR6904
ANALYSIS DATE: February 26, 1992
STATION: Input Can 1
REF.#: 28,284
TIME SAMPLED: 10:15

Parameter	Concentration (ug/L)
Benzene	777.
Toluene	4,280.
Ethylbenzene	220.
Xylenes	1,970.
MTBE	ND[1]

NUMBER OF UNIDENTIFIED PEAKS FOUND: 5

NOTES:

1 Compound not detected in analysis

Reviewed by Suzanne Kendall

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

GC METHOD -- BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES)

CLIENT: S.B. Collins, Inc.
PROJECT NAME: Irasburg General Store
REPORT DATE: February 28, 1992
SAMPLER: Carl Ruprecht
DATE SAMPLED: February 6, 1992
DATE RECEIVED: February 6, 1992

PROJECT CODE: SBIC6837
ANALYSIS DATE: February 25, 1992
STATION: Input Can 1
REF.#: 28,062
TIME SAMPLED: 8:30

Parameter	Concentration (ug/L)
Benzene	866.
Toluene	3,920.
Ethylbenzene	270.
Xylenes	1,340.
MTBE	ND[1]

NUMBER OF UNIDENTIFIED PEAKS FOUND: 3

NOTES:

1 Compound not detected in analysis

Reviewed by Suzanne Gundlach

APPENDIX D

WHPA and APA Justification Report

(2") locations

Date: 8/20/81
Initials: C.A.M.

COMMUNITY WELL/SPRING
INFORMATION SHEET

TOWN: Irasburg TOPO. SHEET: 41D (M)C/School* (B)U/S**

WELL/SPRING # AND NAME: IBW-4 Irasburg Town
3 wells as back-up

I. NEARBY POTENTIAL POLLUTION SOURCES AS DESIGNATED BY THE GROUNDWATER POLLUTION SOURCE INVENTORY, DEC. 1980 AND OTHER INFORMATION SOURCES:
IBL-1 - to the ENE. ≈ 1 mile. Public, owned by town

II. DEPT. OF WATER RESOURCES, WATER QUALITY SECTION, TOWN FILE INFORMATION:

Water Quality Report Yes (3) Maximum Demand, gpd 24,000

Pump Test Records _____ Person to Contact Harvey Sanville

Comments and Miscellaneous Information:
" 1971 drilled, 360' deep, 12' to bdrk., 150+ 100+ gpm " GWPSI.
There is also a well field w/ 2 wells - don't know if they're used or when drilled. Note is on the computer printout from Health Dept. Back-ups. 250' deep, both ≈ 25 gpm. One drys up in summer

(Phone call 8/27/81 Com. w/ Harvey Sanville)
They're all together. #14 is several hundred yards away from others.
B&B drilled 1st 2 wells. early 1960's.
500-700' from road to field
2 houses before bridge over The Creek. Rt. 1 behind House North side of Creek. towards Town

III. WELL DRILLERS RECORDS, WATER RESOURCES DEPT., GROUNDWATER SECTION:

Driller's Log of Community Well: #14 Village of Irasburg 12/3/71
well # / owner when drilled / date

Nearby Wells:

~~#14~~
~~#15~~
~~#16~~
~~#20~~
~~#23~~

latest Health Dept Printout shows backup wells

* municipal/co-op/school water system
** bedrock/unconsolidated/ spring

TOWN: Irasburg
WELL/SPRING #: IBW-4
TOPO. 41

IV. GEOLOGY FOR ENVIRONMENTAL PLANNING SERIES by DAVID P. STEWART:
Title: #1 2 3 (4) 5 6 7 Johnson - Hardwick
Comments: Fig. 18, p30, [29, 31 text]

V. GROUNDWATER RESOURCES/FAVORABILITY SERIES, DEPT. OF WATER RESOURCES AND USGS by ARTHUR HODGES:
Title: Lake Memphremagog / # 2 / —
river and basin / map# / test boring or well #
Comments:

VI. VERMONT DEPT. OF TRANSPORTATION, HIGHWAY CONSTRUCTION MATERIALS SURVEY by town:
Town Name: Irasburg Pits: #14, 13
Comments:

VII. AERIAL PHOTOGRAPHS:

1974 high level		1962 highlevel	1962 low level
26-192	25-003	45-24, 25	
-193	-004	52-124, 125	

VIII. ORTHOPHOTOGRAPHS: AEC owns, yes/no: Not Photographed
town / statewide sheet #

IX. NEARBY HYDROELECTRIC PROJECTS:

X. USDA SOIL SURVEY: Orleans county / Pre-1970 sheet # (Borderline of non-surveyed area)

XI. OTHER SOURCES OF INFORMATION:

Health Dept. Sanitary Survey

Solid Waste Division
Letter: Records of seepage Points in Landfill

Materials - Bridge Project BRA 6211

Literature:

Richardson, C.H., 1929a, Petrography of the Irasburg conglomerate. Vt. State. Geol., 16th Rept. (1927-1928) p. 107-110. SGL, VSL.

Doll, Charles G., 1951, Geology of the Memphremagog quadrangle and the Southeastern Portion of the Irasburg Quadrangle, Vermont, Vt. Geol. Surv. Bull., 3.

(OVER)

Conway, E. F, and Richardson, C. H., 1912, The terr
of Irasburg, Vermont, Vt. State Geologist 8th Rep
p. 141-161.

Ground Water Management Section - Water Quality Division
Ground Water Quality for Selected Vermont Community
Ground Water Systems, March, 1981.

Other Sources of Information

Orleans County

Cady, W.M., Albee, A.L., and Chidester, A.H., 1963, Bedrock geology and asbestos deposits of the upper Missisquoi Valley and vicinity, Vermont. U.S. Geol. Surv., Bull., no. 1122-B, 75 p., SGL.

Doll, C.G., 1951b, Geology of the Memphremagog quadrangle and the southeastern portion of the Irasburg quadrangle, Vermont., Vt. Geol. Surv., Bull., no. 3, 113 p., SGL, VSL.

Marsters, V.F., 1895a, Camptonites and other intrusives of Lake Memphremagog., Am. Geol., v. 16, p. 25-39.

Marsters, V.F., 1904, A preliminary report on a portion of the serpentine belt of Lamoille and Orleans Counties., Vt. State Geol., 4th Annual Rept. (1903-1904), p. 86-102, SGL, VSL.

LOCATION SHEET

TOWN: Irasburg TOPO: 41 WELL/SPRING #: IBW-4

SYSTEM NAME: Irasburg Town Water Dept Coop

OWNER/OPERATOR NAME, ADDRESS, PHONE NUMBER:

Harvey Samuelle, President
Irasburg, Vermont 05845

754-8761

Cell after 4:30

NEARBY WELLS:

Drillers log #	Name & Address	Date Drilled	Use	B/U/S	
#3	Norman Dion, Irasburg	11-29-66	?	B	17 gpm
20	Marcel Lebeau	7/25/73	D	B	8 gpm
26	Marcel Laterre "	7/3/75	D	B	2½ gpm
49	Mike Rogers "	5/13/80	D	B	2½ gpm

COMMENTS ON LOCATIONS FROM FILES:

#14, IBW-4 is 50 yds west of ~~from~~ road, covered by pumphouse

Map of system attached to Sanitary Survey

FIELD NOTES and DATE OF FIELD VISIT:

continued on back

Irasburg

APA #1

Aquifer Protection Area (APA) Project

LAND-USE SURVEY

A.P.A

202A Primary Area ___ Secondary Area

202A Total Acreage of APA

18 Buildings ___ Sewered 18 Unsewered

50% Agricultural lands (95% hay and pasture 5% crop)

30% Forested Lands

.6 Miles of Road Major Routes: Rte. 14 .4 miles

B Surface Water Quality Classification (if applicable)

___ Potential Pollution Sources (derived from Ground Water Pollution Source Inventory, December, 1980):

Discussion of existing and future land-use within designated APA:

The Irasburg Water Dept. Coop operates four wells that are located between Rte. 14 and the Black River. The APA for these wells covers a mixture of land-uses: the developed village area, agricultural and forest lands. The residences in this area use individual on-site sewage disposal systems which should be properly maintained to prevent contamination. Conservative use of pesticides/fertilizers should be practiced on the agricultural lands. The close proximity →

*Information for this survey derived from an analysis of infrared aerial photos (Soil Conservation Service) Oct. 1977 and State of Vermont Department of Water Resources Ground Water Pollution Source Inventory and Classification of Surface Waters and applicable town plans, zoning ordinances and maps.

of Rte. 14 is a potential source of pollution to the wells. Future development is not definite, but interest in subdividing a portion of the APA has been shown.

Without a town plan or zoning, protection may be harder to implement.

IBW-4

State of Vermont
DEPARTMENT OF WATER RESOURCES

Form WR-59

WELL COMPLETION REPORT

(This report must be completed and submitted to the Department of Water Resources, State Office Building, Montpelier, Vermont 05602, no later than 60 days after completion of well.)

Do not fill in
State Well No. 19460
Other No. 72171

WELL OWNER: Village of Irasburg (Name) — Irasburg, Vermont (Mailing Address)

WELL DRILLER: H.A. Manosh Corp. (Name) — Morrisville, Vermont (Mailing Address)

PROPOSED USE OR USES (Check):

☒ Domestic ☐ Agricultural ☐ Business Establishment ☐ Municipal ☐ Industrial

☐ Other (Specify use)

CASING DETAILS (Inside)	YIELD TEST	WATER LEVEL (From land surface) (if possible)	SCREEN DETAILS
Length: 12 Feet	☐ Bailed or ☐ Pumped or ☒ Compressed Air; Hours; GPM	Static: Feet	Make:
Diameter: 6 Inches		During Yield Test: Feet	Material:
Kind: Steel		DRILLING EQUIPMENT	Slot Size
Weight: 19.45 lbs/p/ft		☐ Cable Tool	Length: Ft.
☒ New ☐ Used	Yield: 100+ GPM	☐ Rotary ☒ Air Percussion ☐ Other (specify)	Diameter: in.

TOTAL DEPTH OF WELL 360 FEET

TOWN WELL IS LOCATED IN: Irasburg, Vt.
(Make sketch of well location on reverse side of sheet)

WELL LOG

Depth From Ground Surface	Give description of formations penetrated, such as: peat, silt, sand, gravel, clay, hardpan, shale, limestone, granite, etc. Include size of gravel (diameter) and sand (fine, medium, coarse) color of material, structure (loose, packed, cemented, hard). For example: 0 ft. to 27 ft. fine, packed, yellow sand; 27 ft. to 134 ft. gray granite.
0 ft. to 25 ft.	Medium gray
25 ft. to 360 ft.	No change
ft. to ft.	
ft. to ft.	
ft. to ft.	

YIELD TEST DATA IN G.P.M.
If yield was tested at different depth during drilling, List Below

ft	G.P.M.

RATIONALE FOR APA DESIGNATION: Ironsburg IBW-4
Bedrock well

Important Information

Well Log IBW-4 0-25 Medium Gray
25-360 No change
Length of casing 12 ft 100 gpm well

phone info says 12 ft to bedrock and 150 gpm

Backup wells - used or not used 250' deep, both @ 25 gpm one drops up in summer

Surficial Geology map indicates area of Lake Sand & gravels in vicinity of wells

Highway Dept. Log materials indicates gravel pit in vicinity of IBW-4
Pit # 14 - Lanou Estate. Top material is coarse quartzose sand and brown silty sand with pebbles - Goes to silt-clay with boulders in bottom looks like till
other part of pit silt clay and is varved
Material in knoll appears to bear a close relationship to glacial till - may be wave washed till

Bedrock wells located in Apa, Rock formation near the contact of Eaton Rever formation - structural trends not known in vicinity

Fracture trace varies with different orientations

RATIONALE FOR APA DESIGNATION: Ivesboro IBW-4

Rationale: Overlying material does not appear to be thick enough to be saturated throughout the year. Therefore an infiltration calculation was made using an average figure of 12"/year because of the varying nature of overlying material - Sand, silt, clay (the extent of lower layers is unknown)

100 gpm well

$$\text{radius} = \sqrt{\frac{\text{Amt pumped ft}^3/\text{yr}}{\text{infiltration ft/yr} \cdot \pi}}$$

$$= \sqrt{\frac{6930481.3}{\frac{1\text{ ft}/1\text{ yr}}{\pi}}}$$

$$= 1485 \text{ ft}$$

25 gpm + 25 gpm = 50 gpm centered around well #2

$$\text{radius} = \sqrt{\frac{3465240 \text{ ft}^3/\text{yr}}{1\text{ ft}/1\text{ yr} \cdot \pi}}$$

$$r = 1050 \text{ ft}$$

Area is outlined using 1485 ft. around the IBW-4 and using 1050 ft around the #2 well

APPENDIX E

Ambient Indoor Air Quality Results

aquatec INC.
An Inchcape Company

CORPORATE OFFICES
55 SOUTH PARK DRIVE
COLCHESTER, VT 05446

LABORATORY LOCATIONS
55 SOUTH PARK DRIVE
COLCHESTER, VT 05446

75 GREEN MOUNTAIN DRIVE
SOUTH BURLINGTON, VT 05403

150 HERMAN MELVILLE BOULEVARD
NEW BEDFORD, MA 02740

January 17, 1992

Mr. Steve LaRosa
Lincoln Applied Geology
RD 1, Box 710
Bristol, VT 05443

Re: Aquatec Project No. 91139
Air Monitoring in Irasburg, VT

Dear Steve:

Enclosed are the analytical reports for the indoor air tube samples and quality control (QC) samples collected in Irasburg, Vermont. Samples were collected and analyzed with reference to U.S. EPA Method TO-2 using Carbotrap 300 air tubes and a thermal desorber and gas chromatograph/mass spectrometer.

Indoor air was sampled in the Smith's residence, in the store, and in the second floor apartment on December 31, 1991, and in the Poginy residence on January 8, 1992. Descriptions of the sample locations are listed in Table 1. These samples were analyzed as a group; therefore, QC samples were not included with the January samples. The tenants above the store smoke cigarettes and were asked not to smoke in the apartment during the sampling event. None of the other residents smoke. Air flow through each air tube and limiting orifice was monitored with a calibrated rotameter. Rotameter readings, calibration data, and field measurements were used to calculate air sample volumes at 25°C and one atmosphere.

The three quality control samples consisted of a field blank, a field replicate, and a method spike sample. The field blank sample was treated the same as the air tube samples except the field blank was attached to the sample equipment for less than five minutes and no air was drawn through it.

One replicate air tube sample was analyzed and reported. This sample was collected simultaneously with the primary sample from the Smith's residence.

The method spike air tube sample was spiked by the analyst with a benzene, toluene, ethylbenzene and xylenes gas standard mixture. The percent recovery for these compounds are shown in the analytical report.

If you have any questions, please call me.

Sincerely,

John Hulbert

John W. Hulbert
Environmental Engineer

JWH/amg

Enclosure

91139B14JAN92

Table 1. Sample locations for air samples collected in Irasburg, Vermont on 31 December 1991 and 8 January 1992.

Lab No.	Sample Description	Location
151570	163 Residence	Near the southern wall in the office of Mr. Dave Smith's residence, which is connected to the back of the store
151571	218 Residence	Replicate of the 163 Residence sample
151572	166 Store	Near the middle of the western wall in the store
15174	236 2nd Floor Apt.	On the shelf between the kitchen and dining room of the apartment above the store
152036	219 Poginy Kitchen	Near the southern wall in the kitchen of Poginy's property which is adjacent to and downgradient from the property store

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ANALYTICAL REPORT

Lincoln Applied Geology
RD 1, Box 710
Bristol, VT 05443

Attention : Steve LaRosa

Date : 01/09/92
ETR Number : 29822
Project No.: 91139
No. Samples: 9
Arrived : 12/31/91

Standard analyses were performed in accordance with Methods for Analysis of Water and Wastes, EPA-600/4/79-020, Test Methods for Evaluating Solid Waste, SW-846, or Standard Methods for the Examination of Water and Wastewater.
All results are in mg/l unless otherwise noted.

Lab No./ Method No.	Sample Description/ Parameter	Result
151569	240 Field Blank:12/31/91 @0845(AirTube)	
OR212	Benzene	<0.3
OR212	Toluene	<0.3
OR212	Ethylbenzene	<0.2
OR212	Xylenes	<0.5
151570	163 Residence:12/31/91 @0825(AirTube)	
OR212	Benzene	2.4
OR212	Toluene	7.1
OR212	Ethylbenzene	0.6
OR212	Xylenes	2.5
151571	218 Residence:12/31/91 @0825(AirTube)	
OR212	Benzene	2.0
OR212	Toluene	6.8
OR212	Ethylbenzene	0.5
OR212	Xylenes	2.1
151572	166 Store:12/31/91 @0825(AirTube)	
OR212	Benzene	3.6
OR212	Toluene	16
OR212	Ethylbenzene	1.4

< Cont. Next Page >

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ANALYTICAL REPORT

Lincoln Applied Geology
RD 1, Box 710
Bristol, VT 05443

Attention : Steve LaRosa

Date : 01/09/92
ETR Number : 29822
Project No.: 91139
No. Samples: 9
Arrived : 12/31/91

Standard analyses were performed in accordance with Methods for Analysis of Water and Wastes, EPA-600/4/79-020, Test Methods for Evaluating Solid Waste, SW-846, or Standard Methods for the Examination of Water and Wastewater.
All results are in mg/l unless otherwise noted.

Lab No./ Method No.	Sample Description/ Parameter	Result
151572	166 Store:12/31/91 @0825(AirTube)	
OR212	Xylenes	7.1
151574	236 2nd Floor Apt:12/31/91 @0834(AirTube)	
OR212	Benzene	3.9
OR212	Toluene	11
OR212	Ethylbenzene	1.1
OR212	Xylenes	5.7
151576	179 Method Spike:12/31/91 @0847(AirTube)	
OR212	Benzene	100%
OR212	Toluene	96%
OR212	Ethylbenzene	99%
OR212	Xylenes	93%

Comments/Notes

Results shown for Lab No. 151576 are % recoveries of matrix spikes.
Other results are reported as ppb (v/v) in the sampled air at 25C and 1 atmosphere.
A sample volume of 4.98 liters was assumed for the field blank (Lab No. 151569).

< Last Page > Submitted By : Neal E. Van Wyck Aquatec Inc.

aquatec INC.
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ANALYTICAL REPORT

Lincoln Applied Geology
RD 1, Box 710
Bristol, VT 05443

Attention : Steve LaRosa

Date : 01/14/92
ETR Number : 29952
Project No.: 91139
No. Samples: 2
Arrived : 01/09/92

Standard analyses were performed in accordance with Methods for Analysis of Water and Wastes, EPA-600/4/79-020, Test Methods for Evaluating Solid Waste, SW-846, or Standard Methods for the Examination of Water and Wastewater.
All results are in mg/l unless otherwise noted.

Lab No./ Method No.	Sample Description/ Parameter	Result
152036	Poginy Kitchen, 219:01/09/92 @0815(AirTube)	
OR212	Benzene	1.1
OR212	Toluene	1.8
OR212	Ethylbenzene	0.2
OR212	Xylenes	1.0

Comments/Notes

Results are reported as ppb (v/v) in the sampled air at 25C and 1 atmosphere.

< Last Page > Submitted By : Neal E. VanWyck Aquatec Inc.