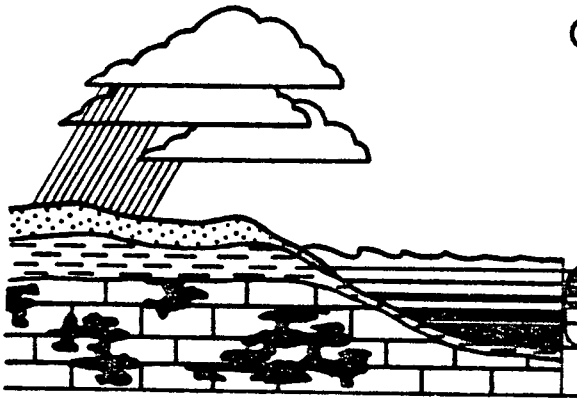
GROUNDWATER INVESTIGATION

REPORT NO. 84-13



GROUNDWATER

CONSERVE AND PROTECT

GROUNDWATER SECTION

LENA ROAD LANDFILL AREA

MANATEE COUNTY

SEPTEMBER 1984

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Report on Investigation at the Lena Road Landfill Area, Manatee County

September 1984

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Executive Summary

The Lena Road Landfill is a domestic and industrial (Class I) solid waste facility operated by Manatee County. Adjacent to it is the previous landfill site that has been abandoned and is now being leased to a local gun and archery club. Both sites are located in a semi-rural area about 10 miles east of Bradenton.

Evidence of environmental problems at the operating landfill, brought forward during permit application review, led to investigation by Groundwater Section personnel and others. Inadequate leachate control by the ditch system at the landfill and improper abandonment of the old Gun Club site have led to ground water contamination in the surficial aquifer and intermittent discharge of leachate contaminated water to surface water. Investigations by the Groundwater Section Operations Response personnel, including monitoring well installation and sampling as well as surface geophysical surveys, have characterized leachate plumes in the surficial aquifer emanating from both sources. Leachate, moving in the direction of shallow ground water flow to the north and northwest, has passed beyond both site boundaries. Leachate contaminated ground water has been chemically characterized as containing above trace levels of volatile organics including benzene, toluene, xylene and dichlorobenzene, as well as elevated levels of iron, chloride and specific conductance.

Monitoring well and potable well sampling data for the underlying intermediate aquifer system, showing trace levels of

volatile organics, give reason to suspect the Gun Club site as a source of contamination in deeper water-bearing units.

Recommended action includes rapid execution of planned remedial measures, which include containment and recovery of shallow contaminated ground water, proper closure and capping of the Gun Club site and additional monitoring and evaluation of the sites as sources of deeper contamination.

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1.0 INTRODUCTION

Lena Road Landfill is a Class I solid waste disposal facility that serves Manatee County. Due to data that became available in permit negotiations and to public interest, the landfill and an adjacent abandoned landfill site have come under the scrutiny of the Department of Environmental Regulation as a potential source of ground water degradation and a possible threat to public health. The objectives of the study detailed herein have been to evaluate the two sites as contamination sources, to determine the extent to which degradation of ground water quality may have occurred and to assess the impact these sites may have on potable water supplies in the vicinity.

2.0 SITE DESCRIPTION

2.1 Lena Road Area

The study area lies in west central Manatee County, approximately 10 miles east of Bradenton and about three miles east of the Braden River (Figure 2.1). This area is roughly bounded to the north by U.S. Highway 64 and to the west by Interstate 75. Lena Road, the main surface road in the study area, dead ends at the landfill.

Development in the area exists for the most part as private single family residences. Except for a subdivision approximately one-half mile northwest of the landfill, the area is semi-rural with the housing density being fairly low. Land to the east and south,

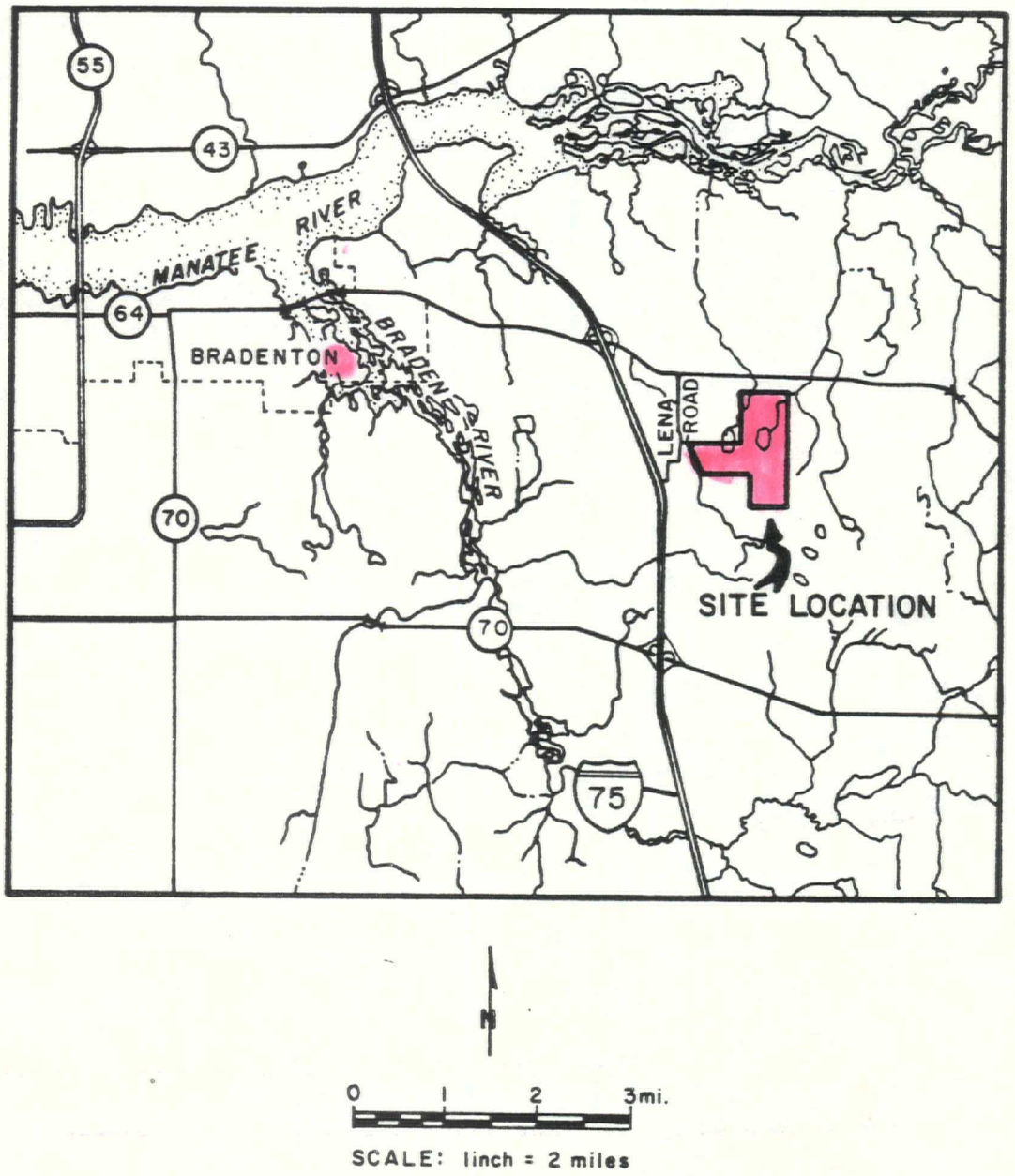


Figure 2.1 Lena Road Site Location

adjacent to the landfill and old landfill sites, is owned by Schroeder-Manatee, Inc., a land owning corporation. This land consists of pine plantation, pasture and cut over areas. To the north and west is pasture land owned by the C. T. Adams Ranch.

2.2 Landfill

The Lena Road Landfill (Figure 2.2) presently consists of approximately 148 acres and is legally located in "the South 1/2 of the N.W. 1/4 and the N. 1/2 of the S.W. 1/4 of Section 6, Township 35 South, Range 19 East." The property is owned by SMR Golf Properties, Inc., a subsidiary of Schroeder-Manatee, and is leased to Manatee County. The site is rectangular in shape, with east-west and north-south dimensions of 750 by 875 yards. A perimeter ditch used for storm water control encircles most of the landfill.

Permitting records indicate that the landfill has been in operation as a Class I facility since the early 1970's. Individuals working at the site have said that waste is buried to a depth of about 12 feet. Presently the landfill at it's highest point is approximately 30 feet above ground surface. Most of the site has been used to fill refuse except for the southern and southwestern areas, which have been used for borrow material and storm water storage. A storm water/leachate storage pond of approximately 10 acres is located in the southwestern corner of the landfill compound.

Ground water quality at the landfill has been monitored by a network of 11 shallow (12 to 15 foot depth on average) 2 inch PVC

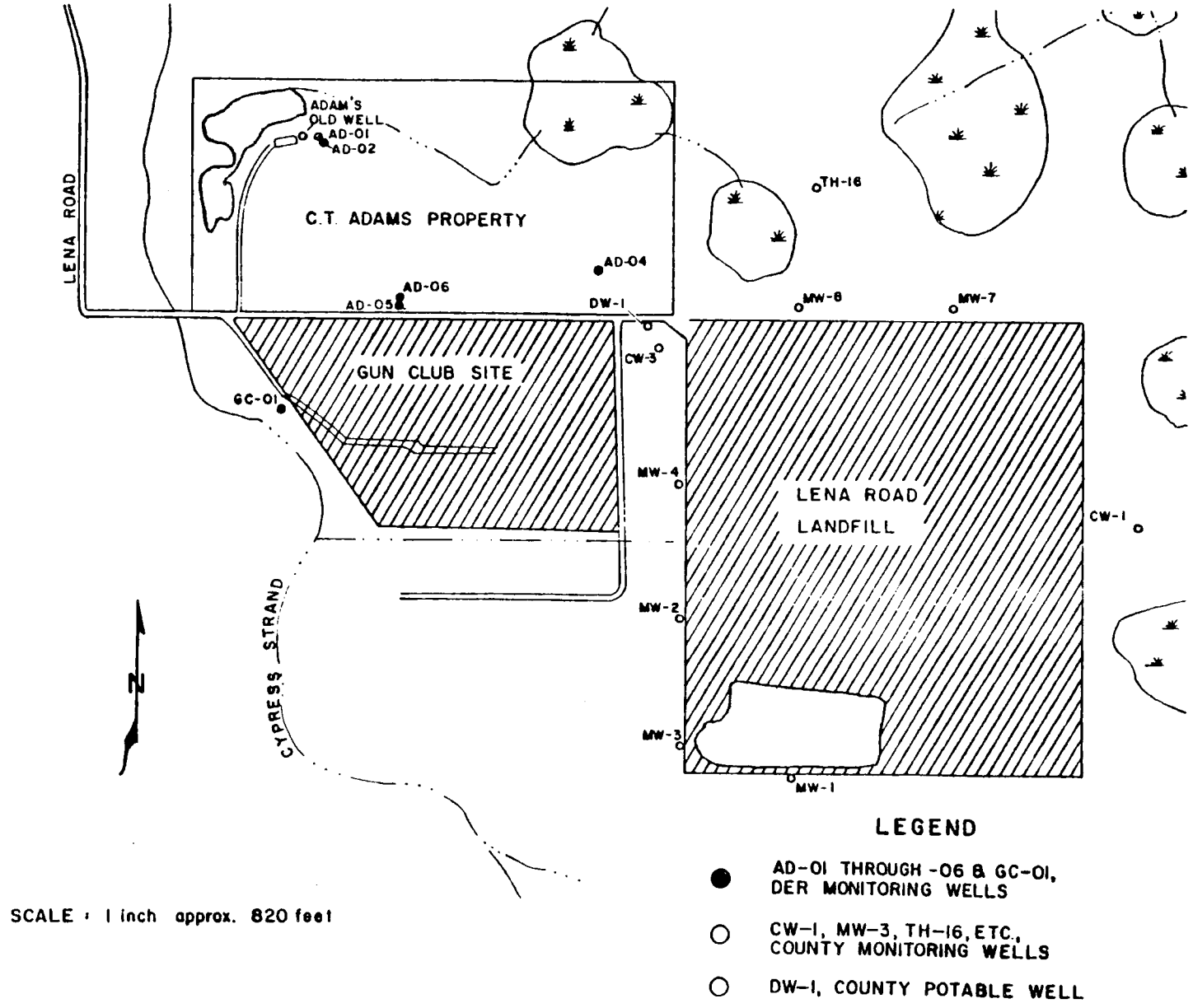


Figure 2.2 Lena Road Site Map

wells. Monitoring data from wells north of the landfill first gave indication of the possibility of ground water degradation.

2.3 Gun Club

An old abandoned county landfill site of approximately 50 to 60 acres is located immediately west of the operating landfill (Figure 2.2). The property is owned by Manatee County and is currently being leased to a local gun and archery club as a shooting range. For this reason the old site is called the "Gun Club site". The site is bounded on the north by Lena Road, to the east by Lena Road Landfill, to the west by the drainage way, Cypress Strand and to the south by a drainage ditch. At the time the old landfill was in operation there was no control over waste disposal practices, thus, little is known about the site. It is known that this site was the predecessor of the present landfill and was used for trench burial of domestic waste and construction debris. Subsurface and geophysical investigation by the County's consultant have indicated that buried waste extends northward underneath Lena Road, beyond the area that is obviously expressed at ground surface as a landfill (Ardaman and Associates, 1984). Unconfirmed reports have indicated waste burial to a depth as great as 30 feet. A ground water monitoring plan for the Gun Club has been recently submitted by Manatee County for Department review.

3.0 HISTORY

3.1 Facility History

The Lena Road Landfill was originally permitted in 1973 by the Florida Department of Pollution Control as a Class I solid waste disposal site. In March of 1983 Manatee County applied for an extension of the operating permit for the site and for a permit to construct a new landfill on the 200 acre site immediately to the north. At the time of this writing, the department has not issued either an operating permit for the existing landfill or a construction permit for the expansion. The landfill is presently operating under a consent order between DER and Manatee County.

Caution on the part of the DER in granting a permit has been due to the discovery of a potential ground water contamination problem north of the landfill and to a historical problem the landfill operator has had with containing storm water and leachate on-site. Conditions at the site during prolonged periods of rainfall have frequently resulted in an unmanageable situation where the perimeter ditch overflowed or was breached. The resulting discharges to surface water or sheet flow of leachate contaminated water have been cause for concern of nearby residents for several years. Surface water contamination has been documented by sampling by Manatee County Pollution Control, the local environmental program.

Plans submitted by the county for development of a new storm water/leachate collection system at the landfill have recently been accepted by DER and have been incorporated into a construction

permit. A decision on construction of the new landfill awaits DER evaluation of the site.

3.2 Study of Site

As part of their permit application submittal, Manatee County provided a report on existing geologic and ground water conditions at the landfill site. Findings of shallow ground water quality monitoring and a DC resistivity surface geophysical survey submitted in the report gave an indication that a plume of contaminated ground water was located north of the landfill.

In May of 1983, in response to a request from the DER Southwest Florida District office, representatives from the Groundwater Section visited Lena Road Landfill and conducted a surface geophysical survey and sampled six monitoring wells and potable well at the landfill. Findings of this investigation (expounded upon in later sections) confirmed the presence of a contaminant plume north of the landfill that included several potentially health threatening volatile organic compounds. Geophysical findings led the department to also consider the Gun Club site as an additional contaminant source.

As Lena Road Landfill grew more prominent in the public eye, residents of the area became concerned that their water wells might be contaminated by landfill leachate. To determine if such a problem existed, Manatee County Pollution Control and the Groundwater Section conducted an area-wide sampling program, collecting volatile organics samples from a total of 31 residential and other potable wells. Field gas chromatograph analyses indicated the presence of volatile

organics in one of the wells, a potable well located at a mobile home 300 yards north of the Gun Club on the Adams property. Quantitative laboratory analyses showed trace levels of several volatile organics in the well sample that were also found to be common to the landfill leachate. The Adams' well has since been grouted up and abandoned by the owner.

In October of 1983 and April and May of 1984 additional work was conducted to try to determine if there was a link between the Adams' contaminated well and the landfills. In the October visit the Gun Club site was evaluated as a contaminant source by a study that included installation and sampling of shallow sandpoints and additional geophysical work. Findings of this visit further implicated the Gun Club as a source of contamination but failed to link the site with contamination in the Adams wells by way of surface water or shallow ground water flow.

Monitoring wells were drilled on the Adams property north of the Gun Club during the last investigative effort in an attempt to determine if a deeper pathway for contaminant migration existed. Protection of the local drinking water supply and determining the need for cleanup of contaminated ground water relied on this determination. Results of this effort are incorporated in this report. A synopsis of significant DER results prior to this effort is presented as Table 3.1.

Table 3.1. Summary of previous DER ground water sampling efforts.

DER Sampling Date	Description of Sample Type	Parameters Sampled For	Contaminants Indicated*
5/26/83	Landfill monitoring wells: TH-16, MW-7, CW-1, CW-3, TH-1, TH-3, landfill potable well (DW-1)	metals; pesticides; volatile, base-neutral and acid extractable organics	metals - Fe; numerous volatile organics in several wells, TH-16, MW-7, CW-3; lo level extractable organic in 1 well.
9/14,15/83	residential well sampling for gas chromatograph scan	volatile organics	volatile organic peaks in C. Adams well, 3015 Lena Road
9/21/83	Adams old residential well	volatile organics	trace levels of 3 volatile organic compounds
10/18/83	Landfill monitoring well - CW-3; sandpoint wells around Gun Club site, S of landfill, in Adams pasture N of Gun Club; Adams residential well	metals; volatile, base-neutral and acid extractable organics	metals - Fe, Hg in monitoring well and 2 sandpoints; volatile organics in monitoring well, 1 sandpoint well and Adams well, chloride in 2 sandpoints

* Only metals concentrations exceeding DER 17.3, F.A.C. standards noted, all organics noted.

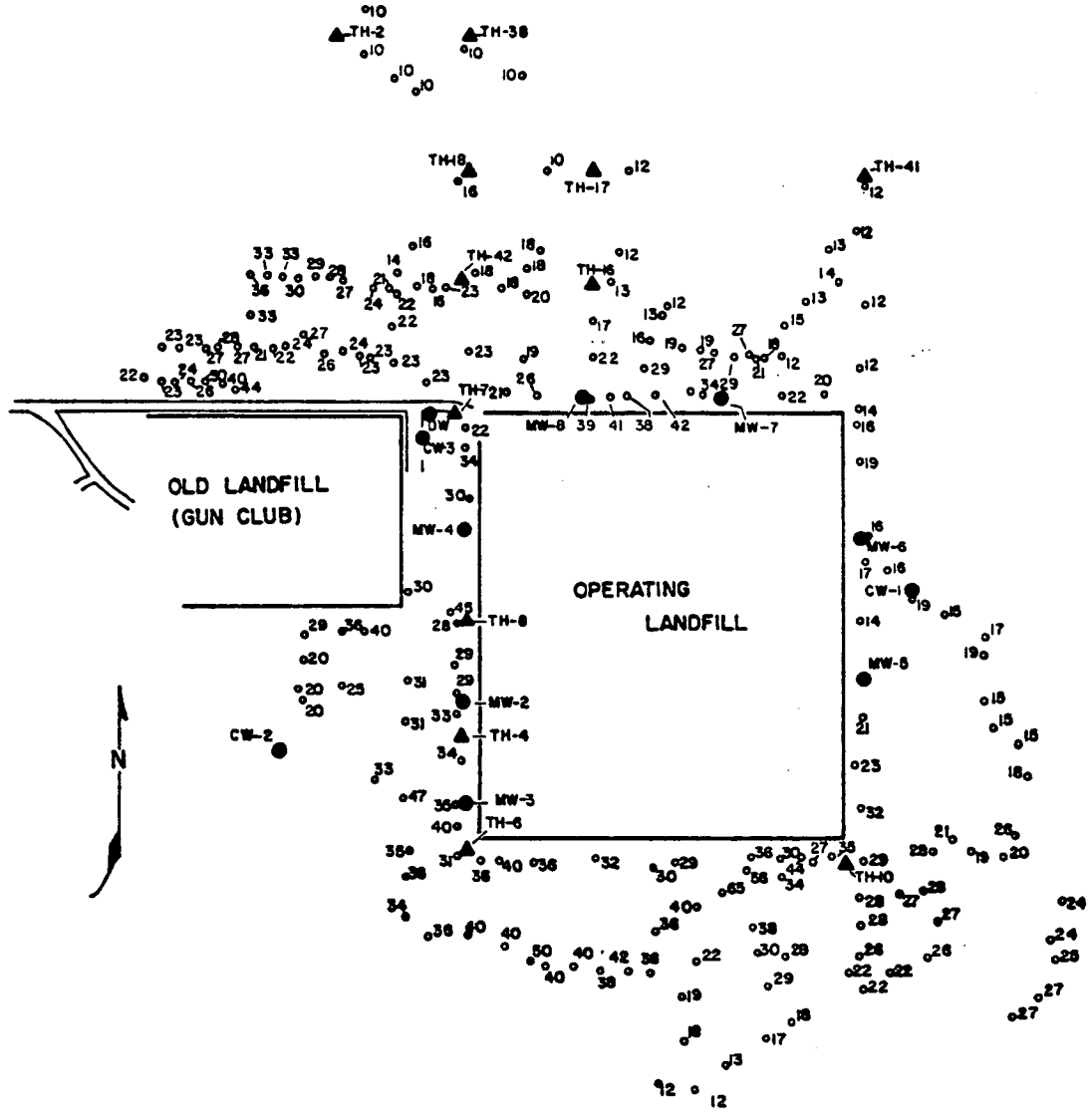
4.0 INVESTIGATIVE METHODS

4.1 Electromagnetic Survey

The Geonics EM-31 and EM-34-3 electromagnetic surveying (EM) instruments were used on several occasions at the site. The EM-31 makes integrated terrain conductivity measurements to a depth of approximately 7 meters (23 feet). The EM-34, using 10 and 20 meter intercoil spacings (horizontal dipole), measured ground conductivity to approximate depths of 7 and 14 meters (23 and 46 feet). These instruments read the electrical conductivity of the ground directly in millimhos per meter. Conductivity measurements can be useful in determining changes in underlying lithology or ground water quality over an area.

Landfill leachate plumes, typically higher in conductivity than ambient ground water, can be readily detected by the EM instrument as gradational increases in conductivity as the source is approached. Changes in lithology often appear as anomalous changes in conductivity on the EM instrument.

Figures 4.1 and 4.2 are maps depicting EM measurements and trends for a survey conducted around the landfill during the week of May 23, 1983. A narrow elongate trend immediately north of the operating landfill appears to be somewhat connected to conductivity highs on the Adams Ranch property directly north of the Gun Club. Areas of elevated conductivity were also observed near the southeast boundary of the landfill and in the area lying southwest of the landfill and south of the Gun Club. Anomalous trends in conductivity



LEGEND

SCALE
1 inch = 504 feet

O^{33} LOCATION OF EM CONDUCTIVITY READING (mmhos/meter)

MW 6 WATER WELL

TH 42 TEST HOLE

Figure 4.1 Lena Road Landfill Electromagnetic Survey Measurements, 5/83.

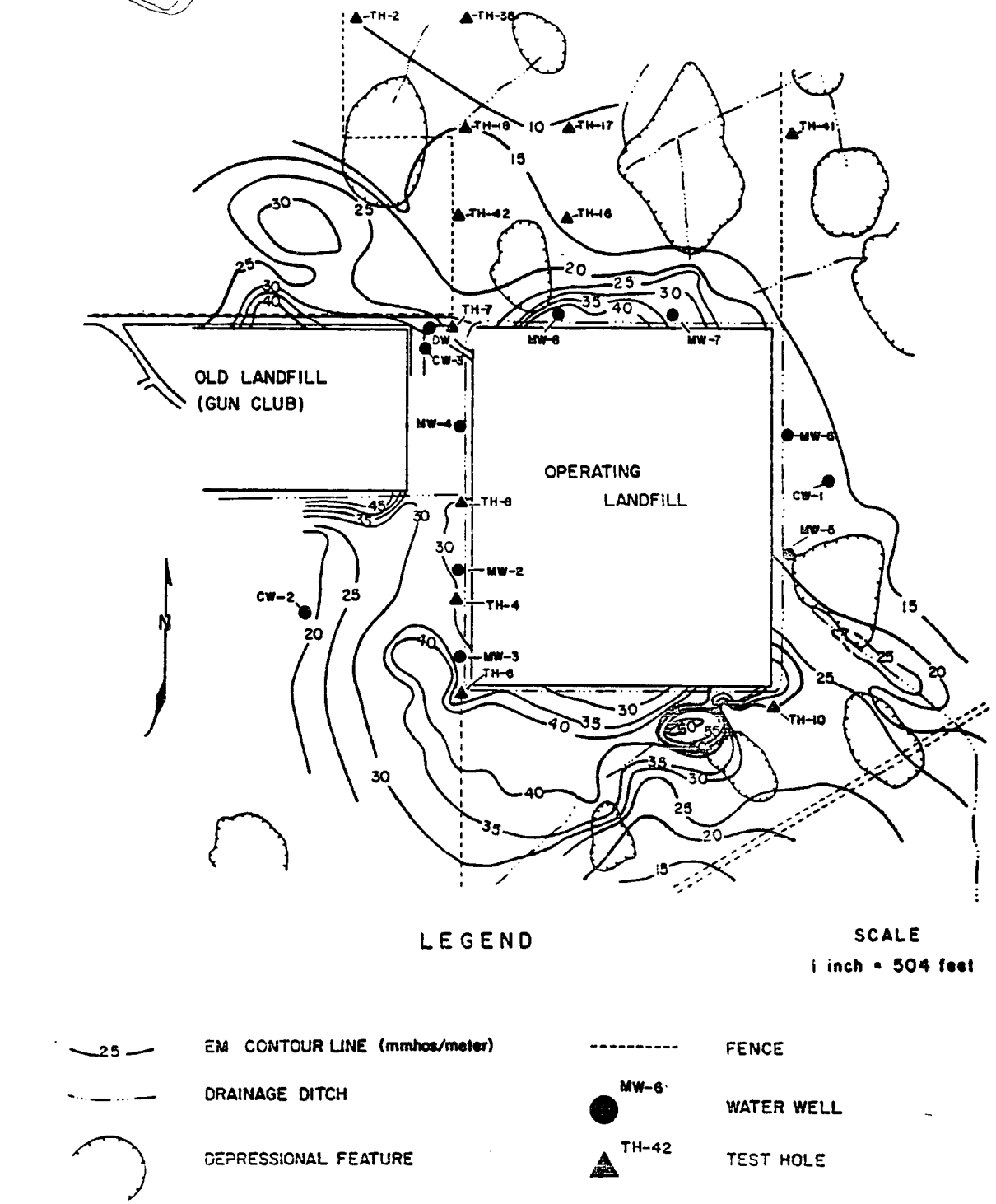


Figure 4.2 Lena Road Landfill Electromagnetic Survey Trends, 5/83.

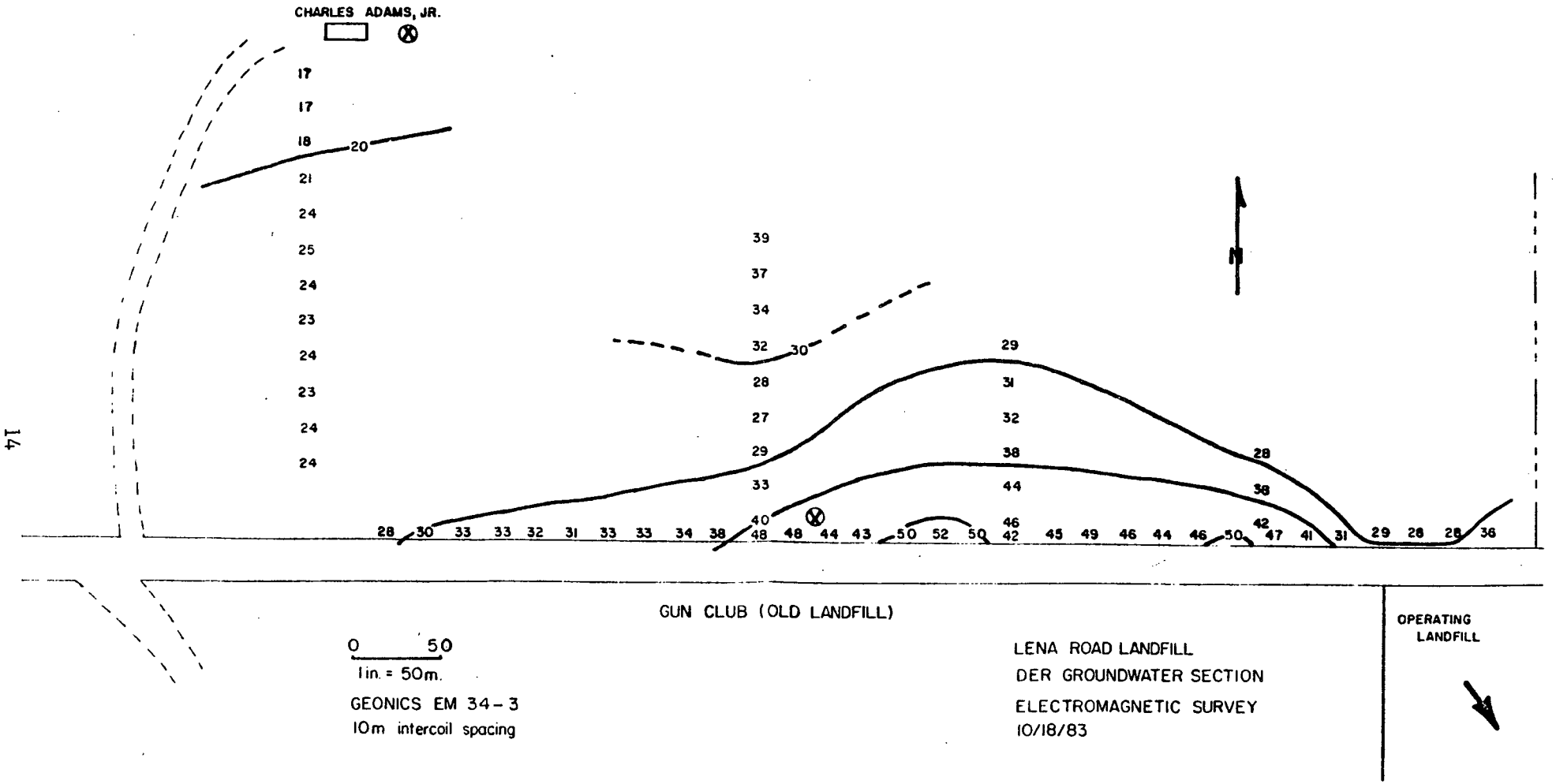
in the southeast and southwest areas make them more likely to be expressions of the underlying lithologies rather than leachate plumes. The trend to the north is more representative of a plume.

Figures 4.3 and 4.4 represent EM-34-3 measurements for a survey conducted on the Adams property north of the Gun Club on October 18, 1983. Using the 10 and 20 meter intercoil spacings allowed the development of EM profiles at two different depths. Trends compare similarly, with highs nearest the edge of the Gun Club. An increase in conductivity to the north in some areas was later shown to be due to a lithologic change from near surface sands to clays (AD-03, test boring in Section 4.2).

4.2 Drilling and Well Installation

A total of six temporary monitoring wells were installed to the north and west of the Gun Club. With the property owner's permission, five wells (AD-01 thru AD-06) were installed in the pasture belonging to the Adams Ranch. These included two well clusters consisting of one shallow and one deep well and an additional shallow well. The other well (GC-01) was a shallow one put in along the western edge of the Gun Club site on Manatee County property. Monitoring well locations are indicated in Figure 2.2. Specific well construction details are tabulated in Table 4.1.

The objective behind monitoring well orientation was to (1) better characterize the extent of leachate migration from the Gun Club site, (2) evaluate the mechanism and rate of ground water movement and interaction between water-bearing zones and (3)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GUN CLUB (OLD LANDFILL)
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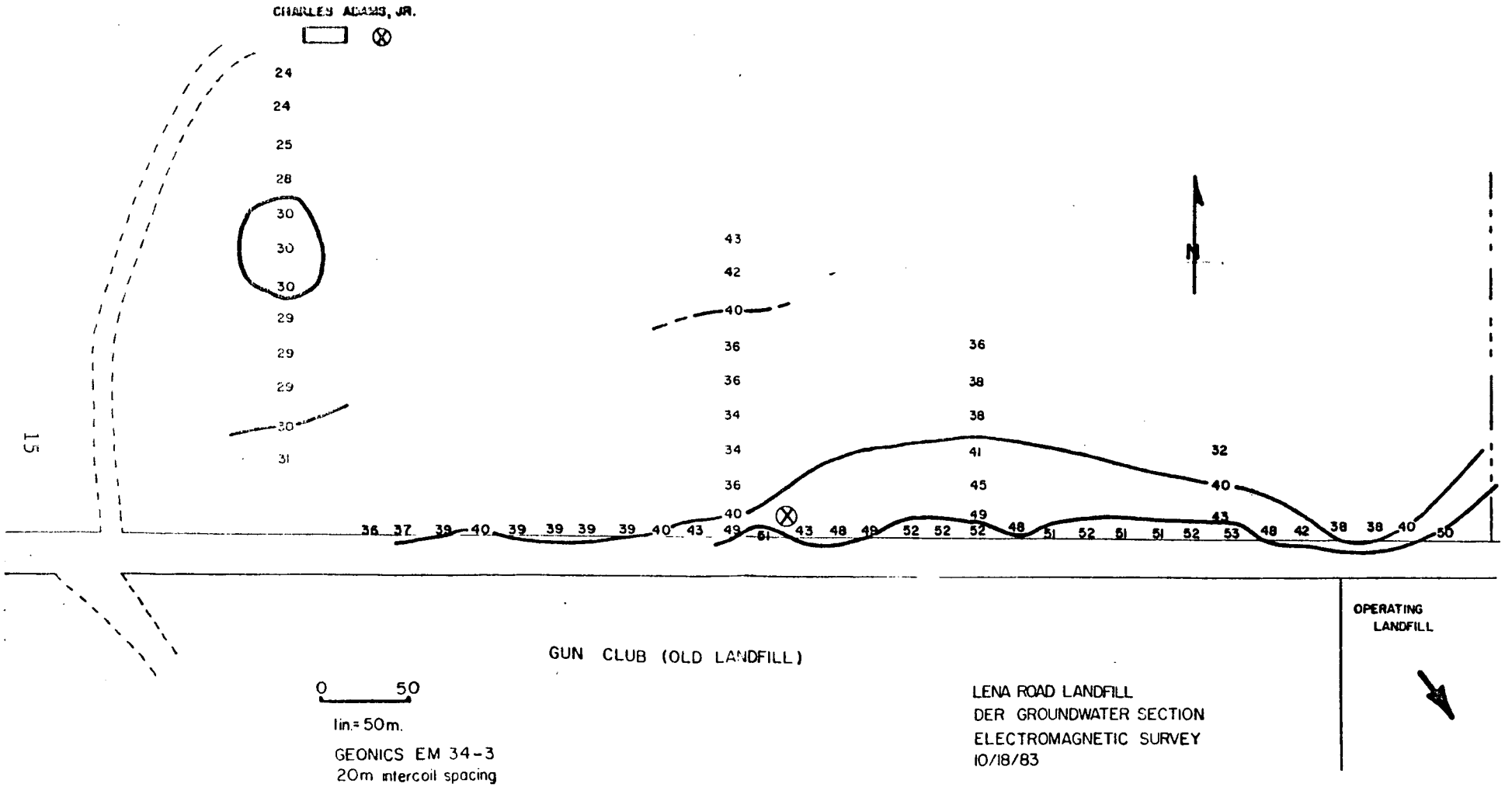
GEONICS EM 34-3
10m intercoil spacing
LENA ROAD LANDFILL
DER GROUNDWATER SECTION
ELECTROMAGNETIC SURVEY
10/18/83

Figure 4.3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GUN CLUB (OLD LANDFILL)
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1in.= 50m.
GEONICS EM 34-3
20m intercoil spacing
LENA ROAD LANDFILL
DER GROUNDWATER SECTION
ELECTROMAGNETIC SURVEY
10/18/83

Figure 4.4

Table 4.1. Monitoring well construction details, Lena Road Landfill

Well I.D.	Total Depth (ft. below g.s.)	Well Diameter (in)	Screened/Open Interval (ft. below g.s.)	Top of Casing Elev. (ft. NGVD)
AD-01	20	2	15 - 20	32.88
AD-02	100	4	63 - 100	35.12
AD-04	16	2	11 - 16	39.09
AD-05	19	2	14 - 19	34.95
AD-06	105	4	58 - 105	35.04
GC-01	23	2	18 - 23	33.02

All monitoring wells were installed in accordance with SWFWMD specifications. Casing material was black steel. Shallow wells (2 in. dia.) were equipped with 5 ft. stainless steel wire wrapped screens. Deep wells (4 in. dia.) were completed as open hole wells with casing grouted into limestone.

determine if volatile organics found in the Adams well were attributable to either landfill site. Wells and test holes were therefore drilled into the more permeable water-bearing zones encountered in the surficial and deeper aquifers so as to intercept contaminants migrating from possible source areas. Orientation of wells was primarily based on geophysical and past sampling results.

Monitoring wells were drilled with a hydraulic rotary rig using bentonite drilling mud and clean water. Lithologic samples were taken from the shallow wells at five foot intervals using a 1 1/2 inch diameter split spoon sampler. From the two deep wells circulated cuttings were logged at five foot intervals. A test boring, AD-03, was advanced in addition to the holes drilled for monitor wells for lithologic characterization.

After installation, all of the wells were developed by jetting with compressed air and pumping for an extended period of time. The purpose of development was to remove evidence of drilling from the well, thereby increasing its production and returning the quality of ground water at the well to the unaffected state (i.e.; before drilling).

Drilling and well installation activities were conducted within a six week period, from late March through mid-April, 1984. After water quality sample collection, field hydraulic measurement and geophysical logging, the wells on the Adams property were properly abandoned according to a legal agreement between the land owner and DER. Abandonment procedures included cutting off the well casings below ground surface and filling the well bores to ground surface

with neat cement. The well installed on the Gun Club property remains and will be sampled by Manatee county as part of their monitoring network.

4.3 Ground Water Sampling

Ground water quality samples have been collected from the Lena Road Landfill area on several occasions. Sampling efforts prior to the most recent effort in May 1984 were briefly outlined in the site history section. Contaminants indicated in these efforts are tabulated in Appendix B.

Following DER Groundwater Section protocol, the sampling procedure for monitoring wells included purging of each well casing by pumping until stable pH and conductance measurements were obtained. Water samples were withdrawn using a teflon tubing - peristalitc pump arrangement that eliminated contact between the sample and potentially contaminating substances. Residential well samples were collected directly from the spigot nearest in line to the pump after the water had run for a minimum of 30 minutes.

Results of the recent sampling effort are incorporated in the following Ground Water Quality Section. In this effort, two rounds of samples were collected: One set, collected during the week of April 23, 1984, was analyzed on the Groundwater Section portable gas chromatograph as a scan for volatile organics. The second set, collected two weeks later, included a total of seven ground water samples from the six DER wells as well as the deep (formerly potable) well at the Lena Road Landfill scale house. Sample parameters

included: volatile organics, base-neutral and acid extractable organics and selected heavy metals. Field measurements for pH and specific conductance were also taken.

5.0 SITE TOPOGRAPHY AND DRAINAGE

The study area is typical of the Coastal Lowlands physiographic region in that topographic variation is very slight. Topography of the Terraced Coastal Lowlands (in which the site lies) is controlled by the series of ancient marine terraces that slopes seaward (Peek, 1958). Natural elevations in the study area range from about 25 feet NGVD in creek bottoms to less than 35 feet NGVD in the highest areas, according to the USGS Lorraine Topographic Quadrangle (USGS, 1944). Topographic slope at the site is generally to the north and northwest. Lena Road Landfill is the prominent landform in the area, ranging 30 to 40 feet above ground surface in height.

The study area is dotted with numerous shallow potholes and small wetlands that provide seasonal or year-round habitat for wetland biota. Seasonal variations in rainfall and resultant fluctuations in the shallow water table govern the amount of water held in these depressions. Many of them dry up during periods of low rainfall and many others are drained by man made ditches. Artificial drainage by ditch systems is a common method that is employed for development of agricultural and pasture land in the area due to the poor drainage conditions.

Natural drainage relief for the study area is provided by perennial and intermittent tributaries to the Manatee River, which

is located several miles to the north. Much of the drainage from the landfill and Gun Club sites is controlled by Cypress Strand (Figure 2.2), which originates south of the Gun Club site and flows northwestward. Previous discharge of water from the stormwater/-leachate ditch at Lena Road Landfill was primarily into Cypress Strand.

6.0 HYDROGEOLOGY

6.1 Geology

The temporary monitoring wells installed north and west of the Gun Club penetrated geologic formations no older than middle Miocene in age. Figure 6.1 illustrates the typical lithologies of the sediments penetrated at the site location. While formations of Manatee County range in age from Recent to Cretaceous only those encountered in this study will be discussed. Information regarding older formations is given in Peek's (1958) discussion of the geology of Manatee County.

Miocene Series

Deposits of Middle Miocene age in Manatee County are referred to as the Hawthorn Group (Tom Scott, Florida Bureau of Geology, personal communication). At the site location the Hawthorn Group is divided into at least two distinct formations, the Arcadia and the Peace River, (Figure 6.1). The lower formation, the Arcadia, is predominately carbonate, being made up of white, sandy, fine-grained

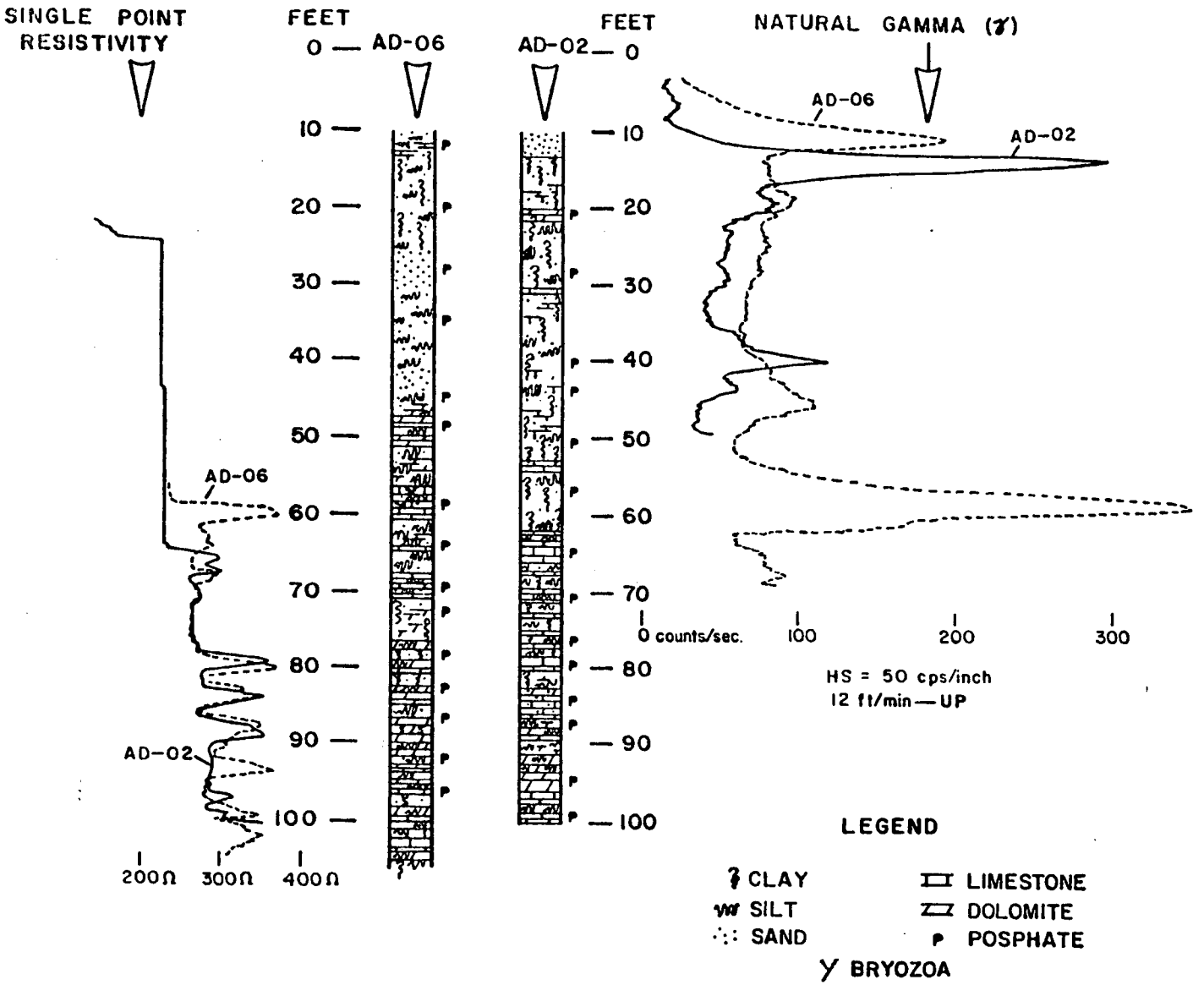

Figure 6.1 Lithologic and Geophysical Profiles of DER Wells AD-02 and AD-06.

limestones and gray to white deposits. Interbedded with these thin carbonates are lenses or layers of olive-gray silty clays. Phosphate is ubiquitous throughout the deposits. Total thickness of the Arcadia at the site location is not known, but approximately 70 feet of the formation were penetrated during coring operations.

The upper deposits of the Hawthorn Group in the site area belong to the Peace River formation. Sediments of the Peace River are primarily clastic, (Figure 6.1). These clastics are variable, ranging from clayey, fine grained quartz sand to silty clay. Pure end members (i.e. - clay or clean sand) do exist, but are neither abundant nor extensive. Thin carbonate stringers also occur within the Peace River. Phosphate is present as rounded pebbles or as fine sand and silt-sized grains and is present throughout the formation. Total thickness of the Peace River at the site is 15 to 20 feet, depending upon where its lower limit is set, as the Peace River formation grades into the Arcadia formation.

Plio-Pleistocene Series

The Hawthorn deposits are overlain by approximately 10 feet of predominately clastic marine sediments. These beds are typically sand with clay and/or marl stringers. Shell material (and in some locations, bone material) is also present. The actual age of these sediments is uncertain and is considered here as simply post-Miocene.

The shelly clastics are discontinuous and in their stead are the Pamlico Terrace deposits of Pleistocene age. These sands are

generally non-fossiliferous and commonly contain a thin hardpan.

Recent Deposits

At the surface lies a thin, gritty, gray to black organic layer. This muck is generally confined to wetlands and adjacent areas. Where it is absent, the Pamlico sand is the surficial layer.

6.2 Ground Water Occurrence

There are three aquifer systems in the clastic and carbonate lithologies of the Lena Road area that may be used to some extent for potable water. These include the Floridan, the intermediate or secondary artesian and the surficial or water table aquifer systems. Of these three the intermediate and surficial aquifers are of primary concern in this study.

The Floridan aquifer consists of lower Miocene to Eocene aged carbonates that are confined from ground surface by the more recent Hawthorn Group and Pliocene and Pleistocene deposits (Peek, 1958). The Floridan is used in Manatee County for irrigation and industrial and domestic use and is capable of providing vast quantities of good quality water. However, due to its relatively great depth, combined with the presence of acceptable quantities of good water from alternative sources, the Floridan is not widely used in the study area for potable supply.

According to Peek (1958) and others the Floridan in most of Manatee County is often under positive artesian pressure relative to the overlying aquifers and thus would not permit vertical recharge

from overlying formations. This area is thus primarily dependent on recharge from up gradient areas to the east where vertical recharge can occur year-round. Potential for contamination of the Floridan from surface sources is very low.

The intermediate or secondary artesian aquifer system consists of intermittent carbonate layers within the thickness of the Hawthorn Group lithologies. It is the primary source of potable ground water in the Lena Road area, where most of the wells penetrate less than 200 feet and tap several water-bearing carbonate layers. Most of these wells are probably only cased to the first competent carbonate layer encountered in drilling.

The intermediate aquifer relies primarily on vertical recharge from the overlying surficial aquifer. Due to the low hydraulic conductivity of the clayey sediments of the Hawthorn Group (as low as 10^{-12} cm/sec), recharge occurs at an extremely slow rate. Under optimum recharge conditions this rate is estimated to be along the order of a few inches to less than one inch per year. However, the intermediate aquifer may be susceptible to contamination where conduits such as deep excavations or improperly cased wells exist.

The surficial aquifer, to our knowledge, is not being used for potable water supply in the Lena Road vicinity. It's use is restricted to heat pump wells, irrigation and perhaps livestock watering. Of the 25 to 30 foot thickness of the surficial aquifer, water-bearing and transmissive zones are found in silty sand layers that measure only a few feet or less in thickness.

Recharge of the surficial aquifer comes directly from

precipitation or from influent surface water bodies. Since it is not confined from surface activities, this aquifer is highly susceptible to contamination from above ground or near surface sources such as landfills.

6.3 Ground Water Flow

Regional ground water flow in the Floridan aquifer is westward under a low gradient (Barr and Schiner 1983). It is expected that regional flow in the intermediate aquifer system is also to the west, with perhaps a northward component as well, as it may discharge to the Manatee River. No published information exists on ground water flow in this aquifer system. Regional flow in the surficial aquifer is largely controlled by surface water drainage, which is primarily to the northwest.

Ground water flow at the site appears to be more complex. Local points of recharge and discharge as well as mounding effects caused by the landfill are factors that influence flow in the surficial aquifer. Complex geology, possible discontinuity of water-bearing units and possible localized recharge of the intermediate aquifer complicate flow interpretation.

Flow in the surficial aquifer at the site appears to agree with the regional northwestward trend, except in areas adjacent to Lena Road Landfill. The elevated lifts of refuse at the landfill afford above ground storage for infiltrating water that causes a mounding effect on the water table. Surficial aquifer flow thus radiates from this mound in the immediate area. Since the buried waste at the Gun

Club does not extend above ground surface, it is unlikely that much mounding in the surficial aquifer occurs there. Water level elevations (Table 6.1) and surficial aquifer flow measurements (Figure 6.2) for the DER monitoring wells indicate a westward to northwestward flow toward Cypress Strand. The rate of flow measurements made by the flow meter range from 0.07 to 16.3 feet per day, which is a reflection of both the areal variability in lithology and the well's proximity to a point of discharge. For example, AD-01 (with a flow rate of 16.3 feet per day) is located next to a pond where evapotranspiration significantly lowers its free surface, thus creating a stronger flow gradient. The well was also screened over a fairly permeable lithologic zone.

Ground water flow in the intermediate aquifer on site may be more complicated than flow in the surficial aquifer. Relative water level elevation measurements between wells are commonly used for evaluating flow direction where the wells are of similar depth and open over homogenous lithologies. Intermediate wells AD-02 and AD-06, having nearly the same total and cased depth (Table 4.1), and being approximately 375 yards apart, were measured and surveyed for general flow determination. Lithologic and geophysical profiles closely match, with both wells intersecting similar water-bearing limestones at similar depths (Figure 6.1). However, an anomaly appears to exist in the relationship between the two water level elevations. Water measurements taken on two occasions after well development showed an approximate 12 foot head difference, with that in AD-06 being the higher (28.77/28.51 NGVD relative to 16.90/16.53 NGVD; Table 6.1).

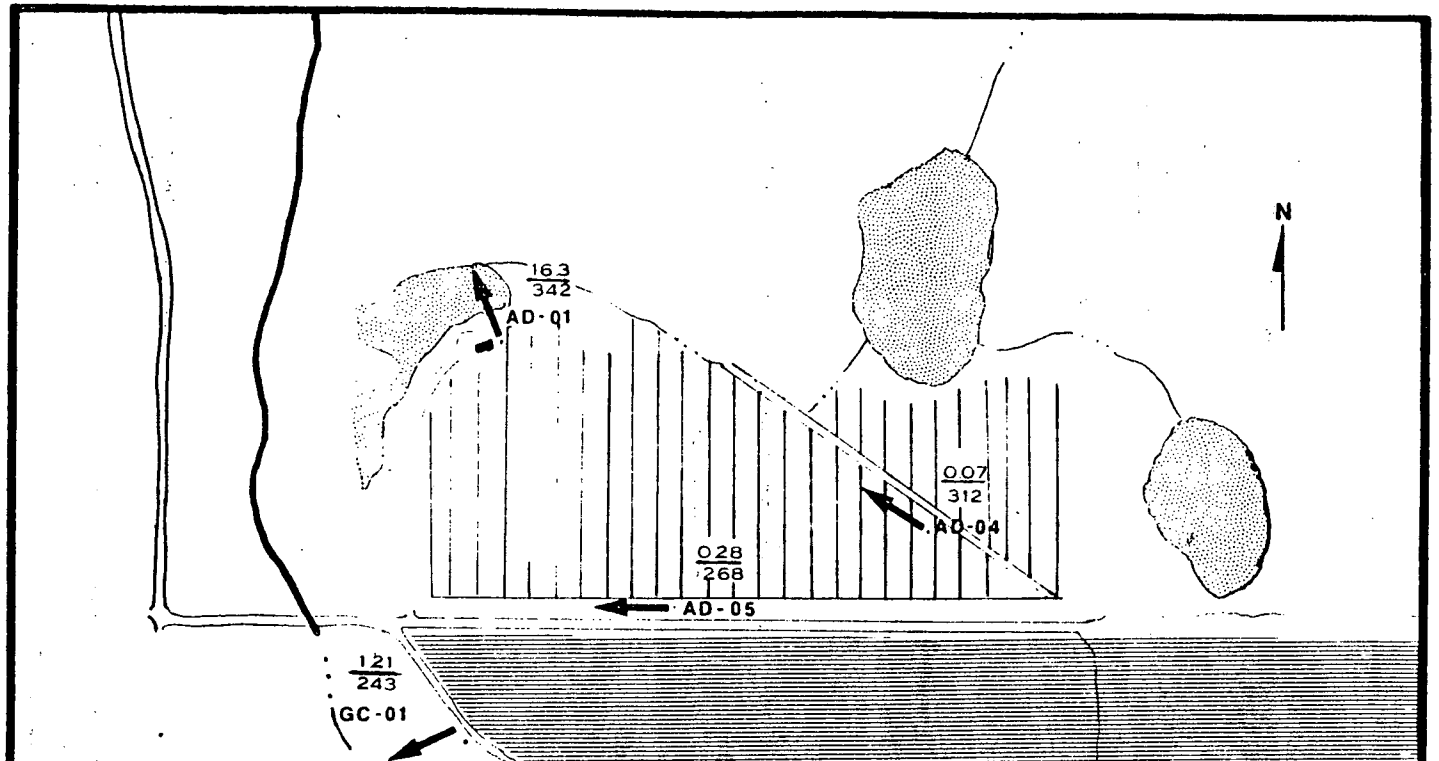

Figure 6.2 Lena Road Landfill Shallow Ground Water Flow

Table 6.1. Ground Water Elevation Survey, Lena Road Landfill

Well I.D.	Date	Top of Casing Elev. (ft. NGVD)	Water Level (ft. below TOC)	Water Level Elev. (ft. NGVD)
AD-01[S]		32.88		
	5/9/84		4.71	28.17
	5/11/84		4.80	28.08
AD-02[I]		35.12		
	5/9/84		18.22	16.90
	5/11/84		18.59	16.53
AD-04[S]		39.09		
	5/9/84		6.18	32.91
	5/1/84		6.26	32.83
AD-05[S]		34.96		
	5/9/84		3.67	31.29
	5/11/84		3.45	31.51
AD-06[I]		35.04		
	5/9/84		6.27	28.77
	5/11/84		6.53	28.51
GC-01[S]		33.82		
	5/9/84		6.26	27.56
	5/11/84		6.29	27.53
TH-43[I]		40.41		
	5/11/84		24.12	16.29

S: Surficial Aquifer
I: Intermediate (Hawthorn) Aquifer

Ground water elevations surveyed relative to county elevation survey stake on Gun Club property.

A water level measurement was also taken on one occasion from TH-43, an Ardaman and Associates piezometer installed at a depth of 150 feet on the County-leased land about 700 yards east of AD-02. The water level elevation, at 16.29 NGVD, corresponds reasonably with those taken from AD-02 and is also considerably lower than those at AD-06.

Several possible explanations exist for the variations in intermediate aquifer head observed as water level elevation differences. The heterogeneity and discontinuity of the Hawthorn Group sediments can cause variations in the aquifer that would result in apparently anomalous water levels according to researchers (personal communication, Tony Gilboy, SWFWMD). Downward leakage from the surficial aquifer by way of a breach in the confining layer near AD-06 and a resulting mounding effect exists as an alternative explanation.

6.4 Ground Water Quality

Ambient ground water in the Lena Road area falls within the DER Class G-II category (Chapter 17-3.403, F.A.C.) for the surficial, intermediate and upper Floridan aquifers. In the surficial and intermediate aquifers, ambient ground water does not exceed existing DER water quality standards except in localized areas where elevated concentrations of iron or sulfate may occur naturally. Any confirmed concentration of man-made organic chemicals detected can be attributed to a contaminant source and is not representative of an ambient condition.

Ground water quality sampling in the Lena Road area by the DER has included surficial aquifer monitoring wells and sandpoints around the operating landfill and Gun Club as well as monitoring and potable wells installed in the intermediate aquifer. Findings of early sampling efforts (summarized in Table 3.1) indicated degradation of the surficial aquifer by several contaminants, but primarily by volatile organics, of which benzene, toluene, xylene and dichlorobenzene were most common. Contamination was most evident in samples collected from points located in close proximity to the northern perimeter of the operating landfill and the Gun Club, namely wells MW-7, CW-3, TH-16 and sandpoint LR-10-19-05. Indicator parameters such as specific conductance and chloride have also pointed to contamination in these areas. Appendix B contains data from earlier sampling efforts.

The most recent sampling efforts have more than confirmed the earlier findings. Contamination of surficial aquifer wells AD-05 and GC-01 (Figure 2.2) was found to be consistent with the earlier findings, both in chemical consistency (volatile organics) and in their concentrations (Table 6.2 and Table 6.3). The absence of contamination in surficial aquifer wells AD-01 and AD-04 more clearly defines the contaminant plume front north of the landfill sites.

Laboratory findings have also indicated trace level contamination by volatile organics in the intermediate aquifer as well. The old Adams well, about 350 yards north of the Gun Club, had been shown to be contaminated by traces of benzene, toluene, xylene and dichlorobenzene. Samples from this well, as from most of the

other wells constructed of PVC plastic casing, have also shown high concentrations of tetrahydrofuran and butanone (MEK), which are indicative of contamination from the PVC well casing.

Intermediate wells DW-01 and AD-02 (Figure 2.2) have both also shown to be contaminated by trace to above-trace levels of volatile organics in the recent sampling efforts (Table 6.2 and Table 6.3). The other intermediate well sampled, AD-06, located less than 30 feet from the Gun Club's northern boundary and adjacent to the shallow contaminated AD-05 was conspicuously free of contamination.

7.0 Information on Contaminants

Table 7.1 lists the environmental contaminants identified in the ground water samples and summarizes the physical, chemical and toxicological parameters of concern. This information was collected from a variety of sources which are listed in the bibliography. However, the majority of the information was obtained from the U.S. EPA Oil and Hazardous Materials Technical Assistance Data System and the NIOSH Pocket Guide to Chemical Hazards.

The following paragraphs present a detailed explanation of each parameter listed in the table:

Chemical

Presents a common chemical name of the substance as identified by the Florida Department of Environmental Regulation SPAN laboratory. Please note that most chemicals have several "common" names and/or trade names.

Table 6.2. Volatile Organics Scan, Lena Road Landfill Study (4/26/84)

Sample Location	Aquifer	Presence of VOC's
DW-01 (Landfill potable well)	intermediate	yes
CW-3 (Landfill monitoring well)	surficial	yes
AD-01 (DER well)	surficial	no
AD-02 (DER well)	intermediate	yes
AD-04 (DER well)	surficial	no
AD-05 (DER well)	surficial	yes
AD-06 (DER well)	intermediate	no
GC-01 (DER well)	surficial	yes

Table 6.3. Contaminants Indicated, Lena Road Landfill Study (5/9/84)

Sample Location	Well Depth	pH (Std. units)	Conductivity (umhos/cm)	Category/ Contaminant	Concentration (ug/l)
GC-01	23	6.4	1170	Volatile Organics/	
				Benzene	5K
				1,2 Dichloroethene	5K
				Other Hydrocarbons	5K
				Other Subst. Aromatics	5K
				Other Halogenated Hydrocarbons	5K
				Extractable Organics/	
				Bis (2-ethyl hexyl) phthalate	25
DW-01	—	8.35	225	Volatile Organics/	
				Chloroform	33.6
				Bromodichloromethane	7.4
				Dibromochloromethane	5K
				Xylenes (total)	5K
				Other Substituted Aromatics	5K
AD-01	20	5.8	500	None	
AD-02	100	6.55	700	Volatile Organics/	5K
				Other Substituted Aromatics	
AD-04	16	7.8	670	None	
AD-05	19	6.0	1450	Volatile Organics/	
				Benzene	5K
				Chlorobenzene	5K
				Ethylbenzene	8.6
				Methylene Chloride	58
				Toluene	5K
				Xylenes (total)	5K
				o-Dichlorobenzene	5K
				n-Propylbenzene	5K
				Other Hydrocarbons	5K
				Other Subst. Aromatics	5K
AD-06	105	7.2	650	None	

Note: K - Actual value known to be less than value given.
Analysis included volatile, base-neutral and acid extractable organics as well as selected metals (As, Cd, Cr, Pb, Hg). All organics indicated are noted, only metals in excess of DER 17.3 Standards noted (in this case there were none).

TABLE 7.1 : PHYSICAL, CHEMICAL AND TOXICOLOGICAL PROPERTIES OF CONTAMINANTS

CHEMICAL	PHASE	MAJOR USE	EXPOSURE ROUTES			CHRONIC TOXICITY			BIOACCUMULATION POTENTIAL	ENVIRONMENTAL PERSISTENCE	SOLUBILITY PERCENT	IDLH ppm
			Inhalation	Ingestion	Dermal	Carcinogen	Mutagen	Teratogen				
BENZENE	LIQUID	SOLVENT	YES	YES	YES	SUSPECT	POSITIVE	NA	MODERATE	MODERATE	0.18	2000
1-2 DICHLOROETHANE	LIQUID	SOLVENT	YES	YES	YES	SUSPECT	NA	NA	NA	MODERATE	0.8	1000
BIS(2-ETHYLHEXYL)PHTHALATE	LIQUID	VACCUM PUMPS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	LIQUID	SOLVENT	YES	YES	YES	POSITIVE	NA	NA	LOW	MODERATE	0.8	1000
BROMODICHLOROMETHANE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DIBROMOCHLOROMETHANE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
XYLENE	LIQUID	SOLVENT	YES	YES	YES	SUSPECT	SUSPECT	SUSPECT	MODERATE	NA	.00003	10000
CHLOROBENZENE	LIQUID	SOLVENT	YES	YES	YES	NA	NA	NA	NA	NA	0.1	2400
ETHYLBENZENE	LIQUID	NA	YES	YES	YES	SUSPECT	NO	SUSPECT	MODERATE	LOW	0.015	2000
METHYLENE CHLORIDE	LIQUID	SOLVENT	YES	YES	YES	SUSPECT	POSITIVE	SUSPECT	LOW	NA	1.3	5000
TOLUENE	LIQUID	SOLVENT	YES	YES	YES	NO	NA	NA	MODERATE	LOW	0.05	2000
O-DICHLOROBENZENE	LIQUID	SOLVENT	YES	YES	YES	SUSPECT	SUSPECT	SUSPECT	MODERATE	LOW	.015	1700
N-PROPYLBENZENE	SOLID	TEXTILE	YES	YES	NA	NO	NA	NA	MODERATE	NA	NA	NA

NA - Not found during literature search

Phase

The physical state of the compound, either solid, liquid or gas as it appears under standard temperature and pressure.

Major Use

Presents a major use of the compound or a type of industry or product the compound is normally used in.

Exposure Routes

Presents the toxilogically important routes of entry which include inhalation, ingestion and dermal. The dermal route of entry covers both skin absorption and skin and/or eye contact. A positive answer indicates a particular exposure route should be avoided.

Chronic Toxicity

Presents a carcinogenic, mutagenic and teratogenic information on the compounds. A "NO" answer which implies "not suspected" indicates a compound has been tested and not found to cause cancer, tumors, genetic defects, or birth defects in mammals. The compounds designated "SUSPECT" were found to cause tumors or have some neoplattigenic effect through testing with animals or exposure studies involving humans. The designation "POSITIVE" indicates the associated effects have been confirmed in animal tests or through human epidemiological investigations.

Bioaccumulation Potential

The bioaccumulation potential, in most cases, was estimated from the octanol/water partition coefficient. In a limited number of cases, data from bioaccumulation tests were available. A compound designated as having a "LOW" bioaccumulation potential has an octanol/water partition coefficient of less than 2 or was reported in the literature as "SUSPECTED" but with no data provided. A designation of "MODERATE" indicates an octanol/water partition coefficient of greater than or equal to 2, and less than or equal to 4. A designation of "HIGH" indicates an octanol/water partition coefficient of greater than 4 or positive animal or plant data.

Environmental Persistence

The system used for designating environmental persistence was very subjective since only limited data were available for most compounds, and the persistence is dependent on a large number of variables. These variables include: the abiotic environment in which the compounds are present (air, soil, water); the temperature; pH and other compounds with which they are in contact.

The designations assigned were LOW, MODERATE and HIGH. Compounds which were reported as non-persistent or had a half-life of several hours to a few days, were designated as having a "LOW" persistence. The compounds which had a half-life of several weeks or months, or were persistent in some parts of the environment but not others (i.e., susceptible to photodegradation but not biodegradation) were designated as having "MODERATE" persistence. Compounds which

persisted in all parts of the environment and had a half-life of several months to years were designated as having a "HIGH" persistence.

Solubility

Presents the solubility in water as a percent. That is: grams compound per 100 grams water at 20 degrees centigrade.

IDLH

The IDLH is the concentration "immediately dangerous to life or health" expressed as ppm (i.e., parts per million). This concentration represents a maximum level from which one could escape within 30 minutes without any escape-impairing symptoms or any irreversible health effects.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

Data generated in DER study at the Lena Road site have clearly implicated the Lena Road Landfill and the Gun Club site as sources of ground water contaminaton within the surficial aquifer. Electromagnetic surveys at the site coupled with water quality and flow data have been used to identify and generally outline a leachate plume front extending northward and northwestward from both sources (Figure 8.1). From water quality data, the plume can be chemically characterized by elevated levels of chloride, specific conductance

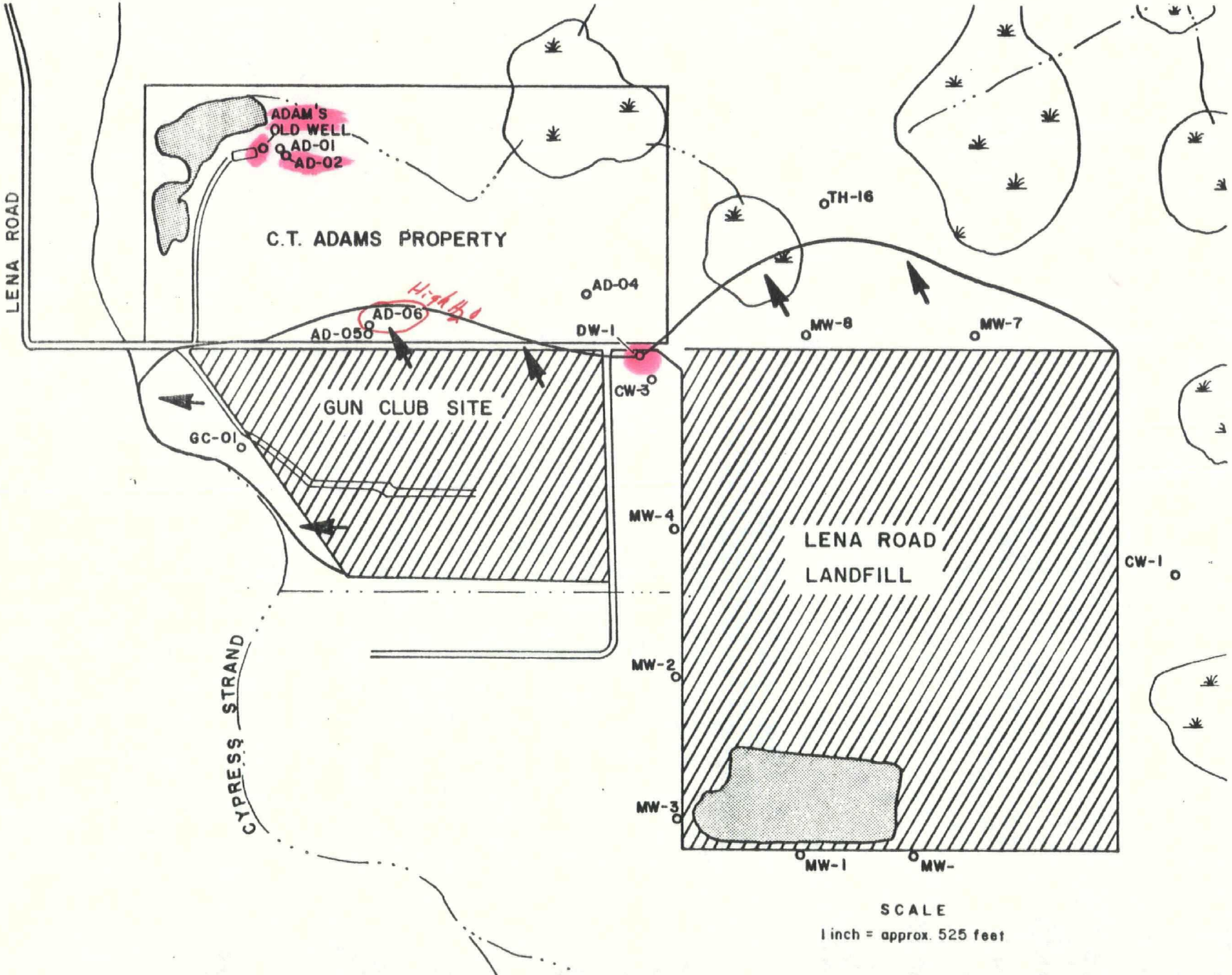

Figure 8.1 Generalized Leachate Plume Map Lena Road Site

and iron as well as the presence of trace and above-trace levels of volatile organics such as benzene, toluene, xylene and dichlorobenzene. While other constituents were indicated in individual well samples, these were consistent throughout the areas affected by landfill leachate.

Individiual wells installed in the intermediate aquifer have been shown to be contaminated by trace level volatile organics. Contaminated wells include the Adams' old well, the potable well at the landfill scale house (DW-01) and the DER monitoring well on the Adams property north of the Gun Club (AD-02). Their proximity and orientation in relation to the landfill and Gun Club (Figure 2.2) implicate one or the other or both sites as a probable source.

The mechanism by which the intermediate aquifer wells were contaminated is not clearly known. Water level elevation data show an anomalous high in DER well AD-06, located just north of the Gun Club, that could be attributed to a mounding effect on the potentiometric surface caused by direct recharge from the surficial aquifer. This mound might be observed in a case where excavation for trench burial of waste or removal of borrow material breached confining clays, creating a permeable conduit to the lower aquifer. While anomalous water level elevations are often seen in the intermediate aquifer due to lithologic variations, lithologic and geophysical logs of DER AD-02 and AD-06 (Figure 6.1) match to the extent that a 12 foot potentiometric head difference (as observed) seems unlikely.

8.2 Recommendations

The contamination problem in the surficial aquifer is well documented and now needs to be addressed in remedial plan development. As part of their permitted plan, Manatee County intends to contain or recover shallow leachate-contaminated ground water on county-leased land north of the operating landfill. However, a plan has yet to be developed for the leachate plume moving from the Gun Club onto the Adams property and westward to Cypress Strand. A ground water monitoring plan for the Gun Club, recently submitted for Department review, is a first step in implementing it. Rapid turn around and approval of a satisfactory plan by DER should be closely followed by appropriate steps to abandon the Gun Club site and recover the leachate plume. Closure of the Gun Club site should entail capping of the landfill surface and containment of ground water by a deep trench system or slurry wall to inhibit leachate migration to neighboring properties or discharge to surface water. Recovery of contaminated ground water entails the installation and pumping of a trench, French drain or well point system to achieve a reversal of ground water flow.

Contamination of the intermediate aquifer is a problem that is not so easily dealt with in that none of the answers are so clear cut, as with the surficial. It is also one that is of much more direct concern to public health in the neighborhood. While none of the wells found contaminated are in service any longer, our data suggests that contamination in the ground water remains and is probably spreading to the west and northwest toward other potable wells.

As a precautionary measure, Manatee County Pollution Control has been periodically sampling residential wells surrounding the landfill for volatile organics. Although to date nothing has been detected, it is important that this program continue. The new potable well at the Adams home should be included in addition if the owner's permission can be granted. Monitoring of the intermediate aquifer north of Lena Road Landfill (as written in the recently issued permit) and installation and monitoring in the intermediate, north of the Gun Club (an addition to the proposed monitoring plan) should serve to provide an early warning of deeper leachate migration.

Additional investigation at the Gun Club site could be useful in determining if direct recharge to the intermediate aquifer is occurring. Aquifer pumping tests and additonal test drilling in the old fill area would provide clues as to the extent and character of the confining material. However, even with this knowledge, little can be done except to properly abandon the old site and make certain the design and operation of Lena Road Landfill come up to environmental standards. Reducing the amount of leachate generated and controlling leachate migration in the surficial aquifer are the obvious results.

The documented ground water and surface water discharge problems at the Lena Road Landfill and Gun Club sites are factors that should weigh heavily in consideration of the proposed landfill expansion. It is our opinion that extraordinary engineering measures would be necessary to assure that similar problems do not arise at the expansion site.

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Appendix A

Drilling and Well Installation Logs

FDER GROUNDWATER SECTION
DRILLING AND COMPLETION INFORMATION

LOCATION: Lena Road Landfill area, Adams Ranch property

BORING/WELL NO.: AD-01
START DRILLING: 3/29/84
COMPLETED: 3/30/84
TOTAL DEPTH: 20'
CASING DEPTH: 20'
HOLE SIZE: 6" CASING SIZE: 2"
DRILLED BY: W. H. Davis
DRILLERS LICENSE NO.: 2338
DIST.: SWFWMD PERMIT NO.:
ELEVATION: 32.88 TOC

SCREEN SIZE-AMOUNT: 5'
METHOD-DRLG: ROTARY: X
AUGER:
OTHER:
DRILLING FLUID: bentonite mud
METHOD-SPLG: CUTTINGS:
SPLIT SPN.: X
SHELBY:
CORING:
CORED INTERVAL: n/a

depth'	spl	sample description	comments
		Dark gray to buff Fine to medium SAND; poorly sorted; w/ trace organics.	Friable organic hard pan 2-3'
5			
10			
15		Light gray to buff slightly clayey to clayey very fine to medium SAND; poorly sorted; some phosphatic pebbles.	
20		Olive gray to brown fine clayey SAND and sandy CLAY interlayered	
25		Olive gray SILT to silty very fine SAND	
30		Olive gray clayey sandy SILT; variable sand and clay content	TD at 32'

FDER GROUNDWATER SECTION
DRILLING AND COMPLETION INFORMATION

LOCATION Lena Road LandFill area, Adams Ranch property

BORING/WELL NO. AD-02
START DRILLING 4|3|84
COMPLETED 4|10|84
TOTAL DEPTH 100
CASING DEPTH 631
HOLE SIZE 8" CASING SIZE 4"
DRILLED BY W. H. Davis
DRILLERS LICENSE NO. 2338
DIST. SWFWMD PERMIT NO.
ELEVATION 35.12 TOC

SCREEN SIZE-AMOUNT n|a
METHOD-DRLG: ROTARY X
AUGER
OTHER
DRILLING FLUID bentonite mud
METHOD-SPLG: CUTTINGS X
SPLIT SPN.
SHELBY
CORING
CORED INTERVAL n|a

depth'	spl	sample description	comments
5			
10		White very Fine SAND	
		Green sandy CLAY ; some phosphate pebbles	
15		White sandy silty CLAY ; calcareous	reaction w/ 10% HCl
20		Green sandy CLAY ; some phosphatic pebbles ; dolomitic	
25		Olive gray sandy silty CLAY ; some phosphatic pebbles ; slightly calcareous	
30			

DRILLING AND COMPLETION INFORMATION CONTINUED

LOCATION Lena Road Landfill area DATE 4/3/84

BORING/WELL NO. AD-02 PAGE 2 OF 3

depth	spl	sample description	comments
35		Greenish-gray clayey SILT; some very fine sand; phosphatic; slightly calcareous	
40			
45		Light gray silty CLAY to clayey SILT; some phosphate pebbles; slightly calcareous	
50			
		Light to dark gray soft LIMESTONE; phosphatic; 53-54' interval	Drill bit chattering 53-54'
55		Light gray clayey SILT; phosphatic	
60			
		Light gray LIMESTONE; phosphatic; slightly cherty	casing set at 63'; not logged below 63'
65			
70			

DRILLING AND COMPLETION INFORMATION CONTINUED

LOCATION Lena Road Landfill area DATE 4/3/84

BORING/WELL NO. AD-02 PAGE

depth'	spl	sample description	comments
			interval not logged 63–100'
75			
80			
85			
90			
95			
100			TD at 100'

FDER GROUNDWATER SECTION
DRILLING AND COMPLETION INFORMATION

LOCATION Lena Road Landfill area, Adams Ranch Property

BORING/WELL NO. AD-03 test hole
START DRILLING 4/11/84
COMPLETED 4/11/84
TOTAL DEPTH 27'
CASING DEPTH n/a
HOLE SIZE 6" CASING SIZE n/a
DRILLED BY P. Spears
DRILLERS LICENSE NO.
DIST. SWFWMD PERMIT NO.
ELEVATION n.d.

SCREEN SIZE-AMOUNT n/a
METHOD-DRLG: ROTARY x
AUGER
OTHER
DRILLING FLUID bentonite mud
METHOD-SPLG: CUTTINGS
SPLIT SPN. x
SHELBY
CORING
CORED INTERVAL n/a

depth'	spl	sample description	comments
5		White to light brown silty Fine SAND; poorly sorted	
10		Gray clayey fine to coarse SAND with blue-gray CLAY streaks; abundant phosphate	
		Yellow to cream colored silty CLAY; calcareous; phosphatic	
15			
20		Gray clayey Fine SAND; calcareous; phosphatic	
25		Light gray to tan silty clayey Fine SAND	TD at 27'
30			

FDER GROUNDWATER SECTION
DRILLING AND COMPLETION INFORMATION

LOCATION Lena Road Landfill area, Adams Ranch property

BORING/WELL NO. AD-04
START DRILLING 4/12/84
COMPLETED 4/13/84
TOTAL DEPTH 27
CASING DEPTH 14
HOLE SIZE 6" CASING SIZE 2"
DRILLED BY P. Spears
DRILLERS LICENSE NO.
DIST. SWFWMD PERMIT NO.
ELEVATION 39.09 TOC

SCREEN SIZE-AMOUNT 5'
METHOD-DRLG : ROTARY X
AUGER
OTHER
DRILLING FLUID bentonite mud
METHOD-SPLG : CUTTINGS
SPLIT SPN. X
SHELBY
CORING
CORED INTERVAL n/a

depth'	spl	sample description	comments
5		Tan very fine to fine slightly silty very fine SAND; loose; subangular to subrounded grains; trace of phosphate	
10		Tan to brown silty clayey mostly medium to coarse SAND; subangular grains; some phosphate	
		Brown silty very fine to fine SAND; loose; abundant organics	
15		Tan clayey very fine to fine SAND and sandy silty CLAY; also streaks of gray-green CLAY; some phosphate pebbles and thin sandstone streaks; Firm	
20		Tan, yellow and green mottled sandy silty CLAY; some pebble phosphate and thin layers of friable sandstone	
		Gray-green clayey SILT; very firm	
25		Gray-green silty, very clayey very fine to fine SAND; dense.	
			TD at 27'
30			

FDER GROUNDWATER SECTION
DRILLING AND COMPLETION INFORMATION

LOCATION Lena Road Landfill area; Adams Ranch property

BORING/WELL NO. AD-05
START DRILLING 4/17/84
COMPLETED 4/17/84
TOTAL DEPTH 22'
CASING DEPTH 19'
HOLE SIZE 6" CASING SIZE 2"
DRILLED BY W. H. Davis
DRILLERS LICENSE NO. 2338
DIST. SWFWMD PERMIT NO.
ELEVATION 34.96 TOC

SCREEN SIZE-AMOUNT 5'
METHOD-DRLG: ROTARY X
AUGER
OTHER
DRILLING FLUID bentonite mud
METHOD-SPLG: CUTTINGS
SPLIT SPN. X
SHELBY
CORING
CORED INTERVAL n/a

depth'	spl	sample description	comments
5		Light brown to white very fine to medium SAND	
10		Yellowish-gray clayey fine SAND; poorly sorted; some phosphate granules and fine pebbles; grades into white to light gray very fine silty SAND; dolomitic	
15			
20		Gray fine SAND; poorly sorted; interlayered with yellow mottled CLAY; dolomitic	
25			
30			

FDER GROUNDWATER SECTION
DRILLING AND COMPLETION INFORMATION

LOCATION Lena Road Landfill area, Adams Ranch property

BORING/WELL NO. AD-06
START DRILLING 4/17/84
COMPLETED 4/19/84
TOTAL DEPTH 105'
CASING DEPTH 58'
HOLE SIZE 8" CASING SIZE 4"
DRILLED BY W. H. Davis
DRILLERS LICENSE NO. 2338
DIST. SWFWMD PERMIT NO.
ELEVATION 35.04 TOC

SCREEN SIZE-AMOUNT n/a
METHOD-DRLG: ROTARY X
AUGER
OTHER
DRILLING FLUID bentonite mud
METHOD-SPLG: CUTTINGS X
SPLIT SPN.
SHELBY
CORING
CORED INTERVAL n/a

depth'	spl	sample description	comments
		Tan fine to medium SAND; trace of organics.	
5		Tan fine to medium SAND with some gray very clayey SAND; traces of phosphate pebbles and bone or shell fragments.	
10		Gray sandy silty CLAY with light tan sandy SILT; fragments of light tan friable silty SANDSTONE; trace of phosphate.	
15		Gray and tannish yellow sandy silty CLAY to sandy SILT; small phosphatic grains common; few rounded phosphatic pebbles.	
20		Mostly gray-green with some yellow, slightly sandy silty CLAY; plastic.	drilling hard at 21'
25		Gray-green fine clayey SAND with abundant small phosphatic grains.	
30		Gray-green clayey sandy SILT with abundant small phosphatic grains	

DRILLING AND COMPLETION INFORMATION CONTINUED

LOCATION Lena Road Landfill area DATE 4/17/84

BORING/WELL NO. AD-06 PAGE 2 of 3

depth'	spl	sample description	comments
		Light gray clayey sandy SILT with abundant small phosphate grains	
40		Light gray clayey very fine SAND with abundant small phosphate grains	
45		Light gray phosphatic DOLOSTONE in thin layers	slight reaction with 10% HCl when crushed
50		Light gray sandy clayey SILT with abundant small grains of phosphate	
55		Light gray phosphatic, fossiliferous LIMESTONE with some gray clayey SILT; bryozoan fossils	strong reaction with 10% HCl on fresh surface; hard drilling began at ~56'; casing set at 58'
60		Light gray clayey SILT with small phosphate grains	drilling soft at 61'; out of limestone
65		same as above	
70		Light gray to greenish-gray dolomitic CLAY	
75		Light gray to white LIMESTONE or DOLOSTONE with greenish-gray CLAY; small phosphatic grains abundant	

DRILLING AND COMPLETION INFORMATION CONTINUED

LOCATION Lena Road Landfill area DATE 4/17/84

BORING/WELL NO. AD-06 PAGE 3 OF 3

depth'	spl	sample description	comments
		Light gray to white clayey SILT; dolomitic; abundant phosphate grains	
85		White silty CLAY; dolomitic; abundant phosphate grains.	
90		Light gray to tan MARL with dolomitic SILT; abundant phosphate grains.	
95		same as above	
100		same as above	
105			TD at 105'

FDER GROUNDWATER SECTION
DRILLING AND COMPLETION INFORMATION

LOCATION Lena Road Landfill area; Gun Club property

BORING/WELL NO. GC-01
START DRILLING 9/10/84
COMPLETED 9/11/84
TOTAL DEPTH 27'
CASING DEPTH 25'
HOLE SIZE 6" CASING SIZE 2"
DRILLED BY P. Spears
DRILLERS LICENSE NO.
DIST. SWFWMD PERMIT NO.
ELEVATION 33.82 TOC

SCREEN SIZE-AMOUNT 5'
METHOD-DRLG: ROTARY X
AUGER
OTHER
DRILLING FLUID bentonite mud
METHOD-SPLG: CUTTINGS
SPLIT SPN. X
SHELBY
CORING
CORED INTERVAL n/a

depth	spl	sample description	comments
5		Gray fine to coarse SAND; poorly sorted; abundant shell fragments.	
		Brown fine to medium SAND; poorly sorted.	
10		Gray coarse to very coarse SAND grading downward into clayey Coarse SAND; poorly sorted; some phosphate; calcareous.	
15		Gray to olive clayey very fine to fine SAND with yellow mottling; some phosphate.	
20		Gray to greenish-gray very fine to fine SAND, grading into fine SAND and CLAY; slightly micaceous; some phosphate.	
25		Greenish-gray sandy CLAY grading into clayey very fine SAND and back into sandy CLAY with sand stringers.	TD at 27'
30			

Appendix B

Laboratory Analytical Data

September 20, 1983

TO: Bill Hennessey, District Manager
Southwest District, Tampa

THROUGH: Rodney DeHan, Administrator
Groundwater Section

FROM: Rick Hicks, Hydrogeologist
Groundwater Section

DATE: September 20, 1983

SUBJECT: Lena Road Landfill Data Correction

It was recently brought to my attention that a typographical error was made in the table of values presented as part of my report dated June 30, 1983. The attached table contains the corrected values.

Attachment

cc: Pat Lewis
Doug Bramlett
Jo McIntosh

RH/ab

LENA ROAD LANDFILL - WQ Monitoring Results
(Week of 5/23)

WELL #	SCREENED INTERVAL (Ft below grd)	PARAMETER	CONCENTRATION (Ug/l)
TH-16	12-17	Volatile Organics	
		Chloroform	5K
		Tetrahydrofuran	16
		Metals	
		Iron	9320
		Lead	5K
		Zinc	15K
MW-7	11-16	Volatile Organics	
		Benzene	5K
		Ethylbenzene	21
		Methylene Chloride	5K
		Toluene	5K
		Vinyl Chloride	5K
		Xylene	38
		n-Propylbenzene	12
		Tetrahydrofuran	58
		2-Butanone	10
		Other Hydrocarbons	15L
		Extractable Organics	
		Phenol	60
		Metals	
		Iron	19,900
		Lead	14.1
		Zinc	53
CW-1	?	Volatile Organics	
		Tetrahydrofuran	9
		Metals	
		Iron	6780
		Lead	5K
		Zinc	15K

WELL #	SCREENED INTERVAL (Ft below grd)	PARAMETER	CONCENTRATION (Ug/l)
CW-3	?	Volatile Organics	
		Benzene	5.5
		Carbon Tetrachloride	22
		Chlorobenzene	6.4
		Ethylbenzene	5.4
		Xylene	14
		Dichlorobenzene	7.0
		Toluene	5K
		n-Propylbenzene	5K
		Tetrahydrofuran	5
		Other Hydrocarbons	10L
		Metals	
		Iron	~~6780~~ 39,600
		Lead	~~5K~~ 11.4
		Zinc	~~15K~~ 22
TH-1	6-11	Volatile Organics	
		Toluene	5K
		Extractable Organics	
		Bis-(2 Ethylhexyl)phthalate	44
		Metals	
		Iron	2790
		Zinc	33
DW-1	80-90	Metals	
		Iron	~~7890~~ 100K
		~~Zinc~~	~~43~~
TH 3	8-13	Metals	
		Iron	7890
		Lead	5K
		Zinc	43

K - Actual value is known to be less than value given.
L - Actual value is know to be greater than value given.

DER GROUNDWATER SECTION SAMPLING OF NEIGHBORHOOD WELLS
LENA ROAD LANDFILL, MANATEE COUNTY

Residence	Sample I.D.	Well Depth	Aquifer	Presence of VOC's
Braun 8105 Brower Dr.	LR-17	200+'	secondary artesian	no
Wilgus 8104 Brower Dr.	LR-18, LR-32	—	secondary artesian	no
McCurry 8205 Brower Dr.	LR-19	115'	secondary artesian	no
Troyer 1704 Lena Rd.	LR-20	120'	secondary artesian	no
Waugh 8305 Brower Dr.	LR-21	—	secondary artesian	no
Fowler 1706 Gillis Dr.	LR-22	—	secondary artesian	no
Gillis 1708 Gillis Dr.	LR-23	—	secondary artesian	no
Johnson 3104 Lena Rd.	LR-24	—	secondary artesian	no
Sheriff's Posse Lena Rd.	LR-25	—	secondary artesian	no
Gun Club Lena Rd.	LR-26	—	Florida or secondary artesian	no
C. Adams 3015 Lena Rd.	LR-27, LR-33	220'	secondary artesian	yes
Musgrave Dairy 8503 S.R. 64	LR-28	—	secondary artesian	no
L. Reagan 10107 S.R. 64	LR-29	—	secondary artesian	no
D.W. Smith 9408 S.R. 64	LR-30	110'	secondary artesian	no
C.T. Adams Ranch	LR-31	—	secondary artesian	no

DER GROUNDWATER SECTION SAMPLING OF NEIGHBORHOOD WELLS
LENA ROAD LANDFILL, MANATEE COUNTY

Residence	Sample I.D.	Well Depth	Aquifer	Presence of VOC's
Franchina 8010 41st Ave. E	LR-1	—	secondary artesian	no
Wetzel 7901 41st Ave. E	LR-2	—	secondary artesian	no
E. Copeland 7905 41st Ave. E	LR-3	127'	secondary artesian	no
Halas 7080 41st Ave. E	LR-4	—	secondary artesian	no
D. Copeland 7903 41st Ave. E	LR-5	120'	secondary artesian	no
McPherson 7804 41st Ave. E	LR-6	156'	secondary artesian	no
Heath 7710 41st Ave. E	LR-7	380'	Floridan	no
GW-3 Monitoring Well County Landfill	LR-8	15'	surficial	yes
Potable Well County Landfill	LR-9	80-90'	secondary artesian	no
W. Smith 2405 Lena Rd.	LR-10	—	secondary artesian	no
Childers 7907 Brower Dr.	LR-11	185'	secondary artesian	no
Morris 7957 Brower Dr.	LR-12	—	secondary artesian	no
Luke 8004 Brower Dr.	LR-13	200'	secondary artesian	no
Greenhalgh 8010 Brower Dr.	LR-14	—	secondary artesian	no
Swick 8007 Brower Dr.	LR-15	—	secondary artesian	no
Weckesser 8011 Brower Dr.	LR-16	—	secondary artesian	no

LENA ROAD LANDFILL - WQ Monitoring Results
(Week of 5/23)

WELL #	SCREENED INTERVAL (Ft below grd)	PARAMETER	CONCENTRATION (Ug/l)
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		Chloroform	5K
		Tetrahydrofuran	16
		Metals	
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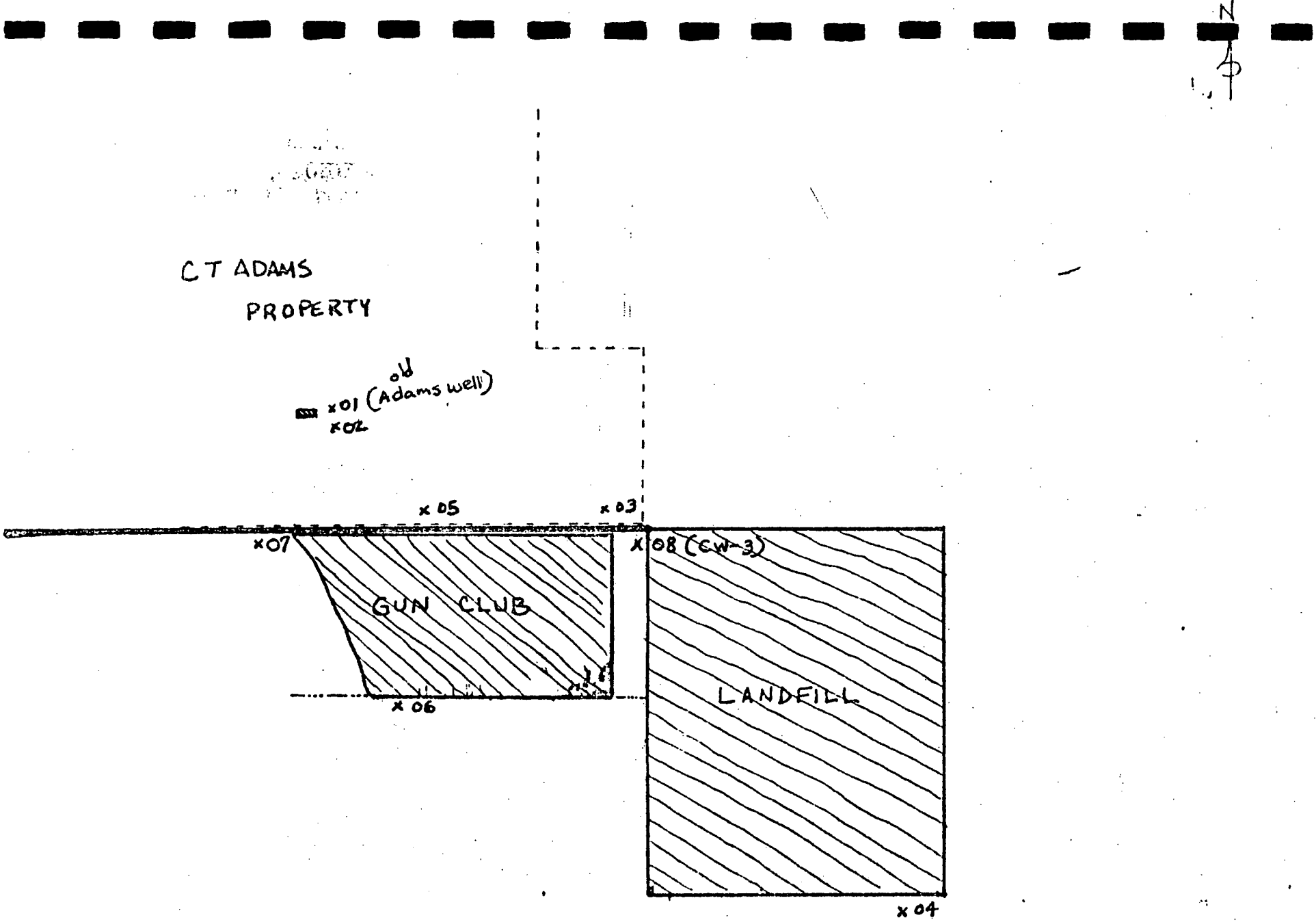
		Lead	5K
		Zinc	15K
MW-7	11-16	Volatile Organics	
		Benzene	5K
		Ethylbenzene	21
		Methylene Chloride	5K
		Toluene	5K
		Vinyl Chloride	5K
		Xylene	38
		n-Propylbenzene	12
		Tetrahydrofuran	58
		2-Butanone	10
		Other Hydrocarbons	15L
		Extractable Organics	
		Phenol	60
		Metals	
		Iron	19,900
		Lead	14.1
		Zinc	53
CW-1	?	Volatile Organics	
		Tetrahydrofuran	9
		Metals	
		Iron	6780
		Lead	5K
		Zinc	15K

WELL #	SCREENED INTERVAL (Ft below grd)	PARAMETER	CONCENTRATION (Ug/1)
CW-3	?	Volatile Organics	
		Benzene	5.5
		Carbon Tetrachloride	22
		Chlorobenzene	6.4
		Ethylbenzene	5.4
		Xylene	14
		Dichlorobenzene	7.0
		Toluene	5K
		n-Propylbenzene	5K
		Tetrahydrofuran	5
		Other Hydrocarbons	10L
		Metals	
		Iron	~~6780~~ 39,600
		Lead	~~5K~~ 11.4
		Zinc	~~15K~~ 22
TH-1	6-11	Volatile Organics	
		Toluene	5K
		Extractable Organics	
		Bis-(2 Ethylhexyl)phthalate	44
		Metals	
		Iron	2790
		Zinc	33
DW-1	80-90	Metals	
		Iron	~~7890~~ 100K
		~~Zinc~~	~~43~~
TH 3	8-13	Metals	
		Iron	7890
		Lead	5K
		Zinc	43

K - Actual value is known to be less than value given.
L - Actual value is know to be greater than value given.



DER GW SECTION

SAMPLING LOCATIONS

10/83

SCALE 1:1000

x 09 - sampling point

LENA ROAD LANDFILL
CONTAMINANTS INDICATED IN DER GROUNDWATER SECTION INVESTIGATION, 10/83

Sample/Location	Contaminants Indicated	Concentration (ug/l)	Standard (ug/l)
LR-10-19-01/Adams Old Well	Volatile Organics:		
	Benzene	8	
	Toluene	5K	
	Xylene	5K	
	Dichlorobenzene	5K	
	Tetrahydrofuran	1700	
	2-Butanone	1500	
LR-10-19-05/Sandpoint along ROW N of Gun Club	Volatile Oranics:		
	Benzene	22	
	Chlorobenzene	7	
	Ethylbenzene	53	
	Toluene	5K	
	Xylene	16J	
	Dichlorobenzene	24J	
	n-Propylbenzene	7.5	
	Tetrahydrofuran	11	
	Other Substituted Aromatics	25K	
	Metals:		
	Chromium	23	50
	Iron	1615*	300
	Lead	50K	50
	Mercury	3.1*	2
LR-10-19-08/Monitoring Well CW-3	Volatile Organics:		
	Benzene	7	
	Chlorobenzene	5K	
	1,1 Dichloroethane	5K	
	Ethylbenzene	10	
	Toluene	5K	
	Xylene	14J	
	Dichlorobenzene	9J	
	n-Propylbenzene	8	

Lena Road Landfill
Contaminants Indicated in DER Groundwater Section
Investigation, 10/83
Page Two

Sample/Location	Contaminants Indicated	Concentration (ug/l)	Standard (ug/l)
LR-10-19-08/Monitoring Well CW-3 (cont.)	Other Hydrocarbons	5K	
	Other Substituted Aromatics	10K	
	Metals:		
	Cadmium	10K	10
	Chromium	20K	50
	Iron	38,258*	300
	Mercury	3.3*	2
LR-10-19-04/SE of Operating Landfill	Metals:		
	Arsenic	11	50
	Iron	18,194	300
	Mercury	1.4	2
LR-10-19-06 S of Gun Club	Metals:		
	Iron	432*	300
	Mercury	.02K	2
LR-10-19-07/Adj. to Creek NW of Gun Club	Metals:		
	Arsenic	9	50
	Chromium	20K	50
	Iron	59,290*	300
	Mercury	0.3	2

*--Exceeds DER drinking water standard
K--Actual value is known to be less than the value given.
J--Estimated value.

From: D.C.Busciglio
To: W.Priesmeyer
Sample Collector: D.Kirk; R.Hicks(DER personnel)
Supervisor: W.Priesmeyer

SPECIAL STUDY

TYPE OF SAMPLE: Groundwater

DATE COLLECTED: 10-19-83

LOCATION: Lena Road Landfill vicinity

Analyses

Station # and Location		Chloride (mg/l)
02	Adjacent Adam's well	12
03	SE corner Adam pasture	10
04	SE corner landfill	100
05	North of Gun Club	174

COLLECTOR'S COMMENTS: Wind: ENE 10-15 mph
Groundwater samples from sandpoint wells to be run for chloride

Analyst: D. Gray
Date Reported: 10-20-83