October 1986 EPA-700/8-87-001

Hazardous Waste Ground-Water Task Force

Evaluation of Texas Ecologists, Inc. Robstown, Texas

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

TEXAS WATER COMMISSION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1201 ELM STREET
DALLAS, TEXAS 75270

September 30,1986

UPDATE OF THE HAZARDOUS WASTE GROUND-WATER TASK FORCE
EVALUATION OF TEXAS ECOLOGIST, INC.,
ROBSTOWN, TEXAS FACILITY

The Hazardous Waste Ground-Water Task Force (Task Force) of the Environmental Protection Agency in conjunction with the Texas Water Commission (TWC) conducted an evaluation of the ground-water monitoring program at the Texas Ecologists, Inc., Robstown, TX (TECO) hazardous waste treatment storage, and disposal facility. The on-site field inspection was conducted over a two-week period from February 4, 1986 to February 14, 1986. TECO is one of over 50 facilities that are to be evaluated by the Task Force.

The purpose of the Task Force evaluations is to determine the adequacy of ground-water monitoring programs at land disposal facilities in regard to applicable State and Federal ground-water monitoring requirements. The evaluation focused on (1) determining if the facility was in compliance with applicable regulatory requirements and policy, (2) determining if hazardous constituents were present in the ground water beyond the known plume of contamination, and (3) providing information to assist EPA in determining if the facility meets the EPA requirements for facilities receiving wastes from response actions conducted under the Federal Superfund program.

Prior to the Ground-Water Task Force evaluation the Texas Water Commission had been monitoring TECO under a 1981 Compliance Agreement for the corrective action of a known plume of contamination resulting from pre-RCRA activities.

Permit:

The TWC has prepared draft documents to address the ground-water monitoring requirements of 40 CFR 264 and Subpart F. Those sections of 40 CFR which require compliance monitoring (40 CFR 264.99) and corrective action (40 CFR 264.100 and 101) are specified in the state rules (Texas Administrative Code) for inclusion in a separate document entitled a "Compliance Plan". The draft permit contains provisions for detection monitoring (40 CFR 264.98) at the point of compliance along the west, south, east and part of the north site perimeters. The proposed point of compliance well system is located to allow for the proposed expansion of operations on the east side of the county drainage ditch. The draft compliance plan contains provisions for corrective action to be conducted between the point of compliance and the down-gradient, facility-property boundary, and also in the site interior, and provisions for compliance monitoring to be performed along the north-east portion of the point of compliance (Figure U-1). The TWC rules on permit issuance (31 TAC 305.401) require that the draft compliance plan be subjected to the same public notice, public hearing and final determination actions concurrently with the draft RCRA permit. The two documents, thus jointly issued, will constitute the RCRA permit.

Subsequent to the inspection, the draft permit and compliance plan were completed by April, 1986, using revised applications submitted by TECO on December 19, 1985. TECO submitted final revisions to the applications on July 3, 1986, in response to discussion with TWC staff. Substantial changes in the applications included:

1) Results of geotechnical evaluation for the undeveloped portion of the site west of the county drainage ditch. TWC staff initially considered this area to be inadequately characterized for construciton of addition landfill trenches.

Point of Compliance subject to CP-50052-001

Area of Corrective Action subject to CP-50052-001

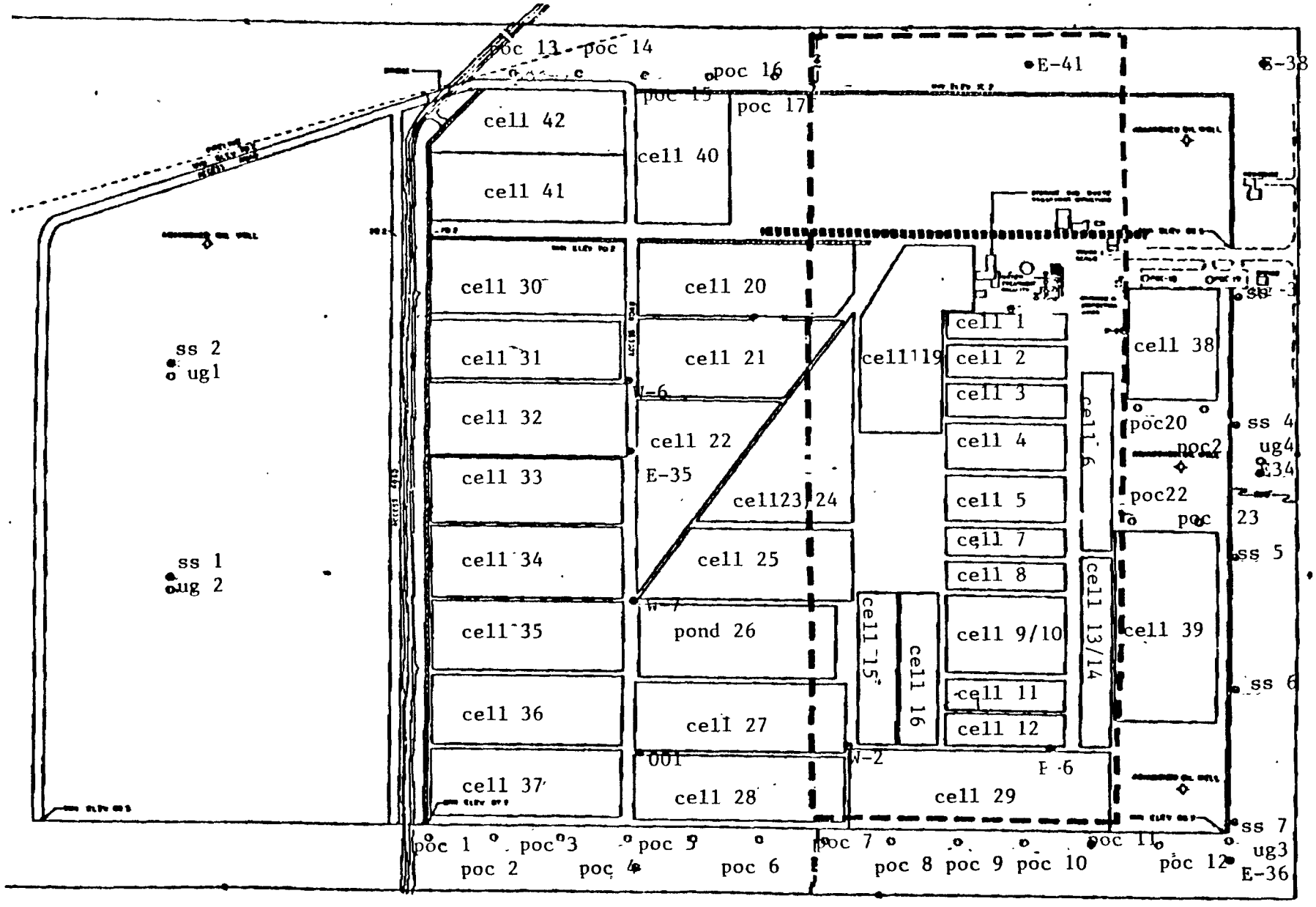


Figure U-1 Monitoring well system proposed within TECO Permit. TECO Waste Management Area Boundary and Point of Compliance follows line of poc prefixed wells. Supplemental wells system is prefixed by ss. Upgradient monitoring wells are prefixed by ug.

2) The ground-water treatment system was transferred from the compliance plan application, where it was considered a non-hazardous component, to the landfill permit application for inclusion as hazardous waste storage and treatment components. The influent from the recovery trench was found to contain arsenic in excess of EP Toxicity levels (>5 mg/l); hence, the 80,000 gallon equalization tank was receiving hazardous waste. All tankage downstream in the treatment system to the arsenic removal process are now considered to be hazardous units.

3) The compliance plan application contained the results of a computer simulation of simultaneous recovery of contaminated ground water and recharge of treated ground water in the north-east portion of the site. Several different combinations of pumpage and recharge rates were evaluated. The study predicted that 11.6 gallons per minute (gpm) pumped from the recovery system and 5 gpm recharged through a series of 8 wells bracketing the recovery trench would prevent spreading of the plume of contamination.

The draft compliance plan and draft permit were modified to include the July 3, 1986 revisions to the applications and comments by TECO to the extent considered acceptable to the TWC staff (Item 1 rejected; Items 2 and 3 accepted). The final drafts were transmitted to the Chief Clerk, Texas Water Commission, on August 1, 1986. TECO was provided with instructions to publish a notice of opportunity for public hearing on their applications in early September 1986. The start of the public hearing has been set to begin at 9:00 AM on October 28, 1986 at the State University of Corpus Christi, Corpus Christi, Texas. A hearings examiner will listen to testimony from all parties named to the hearing, make findings of fact and present a recommendation for issuance or denial to the three-member Texas Water Commission. The Commissioners have final issuing authority for the state-delegated permitting functions of RCRA. The U.S. EPA will then complete actions under federal authority for a final RCRA permit.

Based on findings presented in the Ground-Water Task Force Report the EPA Region VI RCRA Permits staff is recommending several revisions to the draft permit. These changes will be presented as comments during the public notice period. A summary of these comments are listed below:

1. Trench 17/18 (AKA Old Mixing Basin) was identified as a source of contamination in a 1982 ground-water assessment study and included at that time within the TOC plume of contamination boundary. Presently W-17 is the sole recovery well in the southern extremities of the plume of contamination. Based on GWTF sampling data a more vigorous recovery program is warranted in this area. Permit conditions are being developed for the Permit/Compliance Plan that would require an assessment of the current plume of contamination based on Appendix VIII constituents. This includes a plan for expanding the current recovery system in this area and developing alternative corrective action measures (ie., a new recovery trench drain in this area and/or increased number of recovery wells).

2. A study conducted by TECO on the depth of Pre-RCRA trenches 1-14 found several trenches to have penetrated the native clay which constituted the sole liner system used for these trenches. Further, sampling conducted by the Task Force found wells adjacent and among these units to be contaminated with several organic and inorganic compounds. It will be requested by the Regional permitting staff that an assessment of this contamination be added to the Permit/Compliance Plan. The assessment at a minimum will address the source of contamination, extent, and recommendations for corrective action.

3. Monitoring wells W-6 and 001 showed elevated concentrations of organic and inorganic compounds. Because these wells are west and upgradient of the currently identified TOC plume of contamination the source of the contaminants detected needs to be addressed. TWC will instruct TECO to submit an assessment plan for this area. EPA Regional permitting staff will also request that the assessment be included as part of the Permit/Compliance Plan.

4. Monitoring wells installed prior to 1980 (approximately half of the total number of wells on-site) lacked detailed well construction and/or lithologic logs. Though records of well construction logs improved after 1980, many of the monitoring wells installed during interim status also lack detailed information. Depending on plan future usage these wells will either be replaced or plugged. All future monitoring wells installed will meet TEGD standards, as specified in the permit. TECO will be notified of this through the permitting process.

5. The Task Force is recommending that TECO begin using either bailers constructed of inert materials or gas displacment pumps for sampling.

6. The draft permit requires future trenches to not exceed a depth which is two-feet above the mean high water table. Regional EPA permitting staff are suggesting a minimum of 5-feet above mean high water table elevations.

Waste Units:

TECO representatives met with the Region VI Permitting staff on January 21,1985 to discuss the construction design of a landfill unit (Trench 36) and were appraised of the requirements to meet the specifications set out in the minimum technologies requirements (MTR), Section 3004 (o) of RCRA, 42 U.S.C. §6924 (o).

TECO submitted the final Trench 36 design plans on February 20, 1985, which showed that there was no leachate collection system between the liners which extend up the sidewalls. TECO advised EPA on July 31,1985, and November 8, 1985, that it disposed hazardous waste in Trench 36 which failed to provide for a leachate collection system cited above.

EPA, therefore, found that TECO violated Section 3015(b)(1) of RCRA, 42 U.S.C. §6936(b)(1), by disposing of hazardous waste after May 8, 1985,

in a landfill unit which failed to meet MTR. A Complaint, Compliance Order, and Notice of Opportunity for Hearing were issued to TECO on January 10,1986 for the above violation. The Order is currently being negotiated between legal counsels of TECO and EPA.

The Regional EPA office is requesting that TWC add a disclaimer into the permit which describes that upon resolution of the agreement between EPA and TECO, the permit will be modified as appropriate.

Operations:

* During the inspection a method of stabilizing ground-water treatment plant sludge was under study. The draft permit authorizes the use of an enlarged capacity cement mixer than what was originally proposed for the sludge solidification. The use of a filter press as was once considered by TECO, was never formally submitted to TWC and therefore was not placed in the draft permit.

* The TECO septic system vertical drain field is being re-evaluated by TWC to determine the impact on the ground water.

Monitoring and Site Characterization:

* Sizable sand lenses have been identified downgradient of the plume of contamination between wells P-12 and P-13. TWC, as part of the GWTF, will require TECO to conduct aditional monitoring in this area and to determine if these sand lenses could form a vertical migration pathway.

* TECO has installed eight new piezometers in the western portion of the facility in an attempt to better characterize the flow regimes in this area. These new wells were installed during Spring 1986. Figure U-2

Point of Compliance subject to CP-50052-001

Area of Corrective Action subject to CP-50052-001

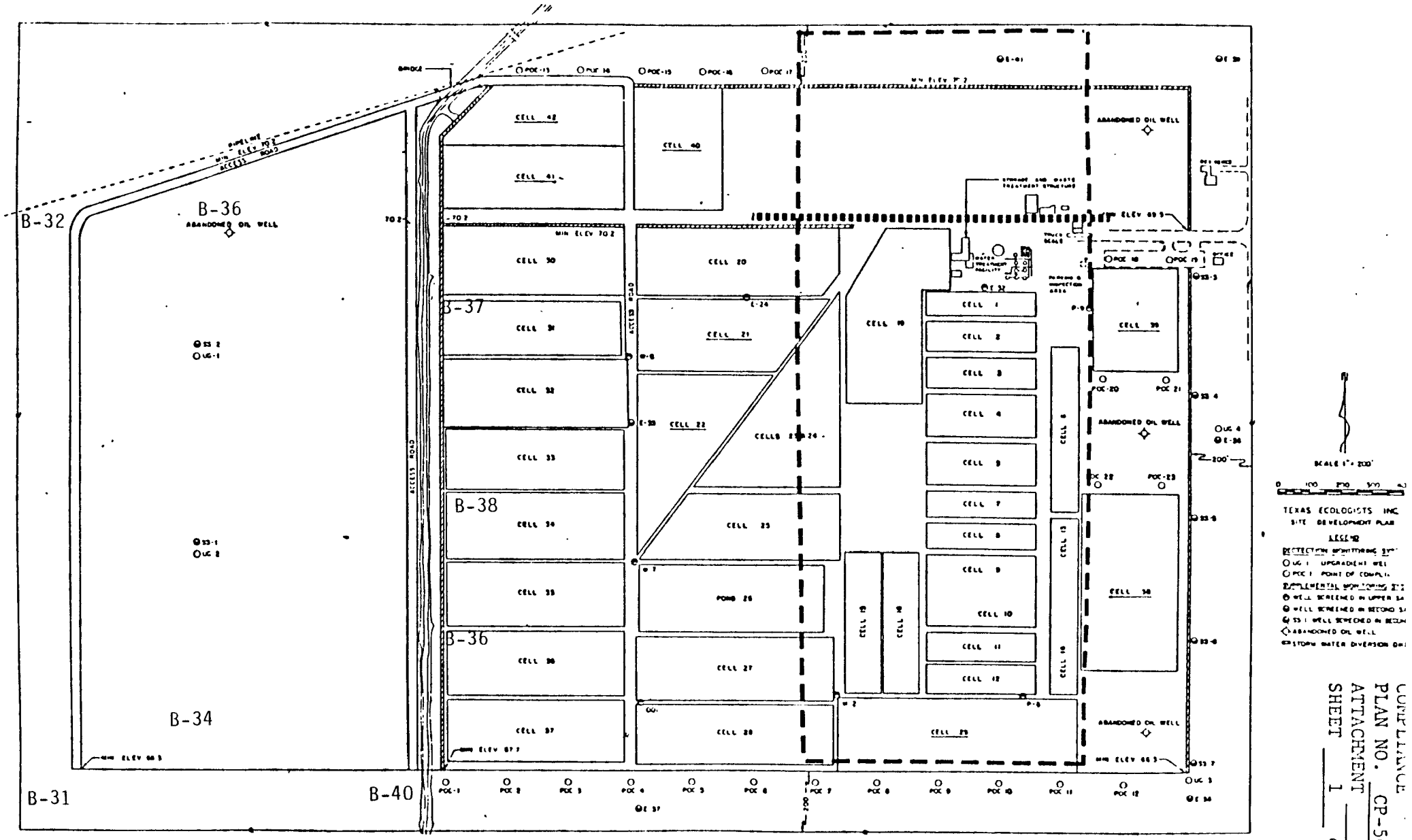


Figure U-2 Location of new ground-water monitoring wells installed Spring'86, (wells designated with a B prefix).

COMPLIANCE
PLAN NO. CP-50052-001
ATTACHMENT A
SHEET 1 of 1

* Due to the varying levels of contamination indicated by the Task Force sampling data, TWC, as part of the GWTF, will require TECO to initiate compliance plan monitoring with expanded list of parameters immediately. This will be included as part of the assessment to TECO.

* TWC will require TECO to conduct an assessment of the low levels of contamination detected in monitoring wells OB-2 and E-48 located north of the boundaries of the plume of contamination. This will be done as part of the earlier described assessment.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
HAZARDOUS WASTE GROUND-WATER TASK FORCE

GROUND-WATER MONITORING EVALUATION
TEXAS ECOLOGISTS, INC., ROBSTOWN, TEXAS

SEPTEMBER 1986

DEBORAH A. VAUGHN-WRIGHT
RCRA HYDROLOGIST
US EPA REGION VI, DALLAS, TEXAS

CONTENTS

EXECUTIVE SUMMARY — Page

Introduction..... 2
Summary of Findings and Conclusions..... 6

TECHNICAL REPORT

Investigation Methods..... 14
Records/Documents..... 14
Facility Inspection..... 15
Laboratory Evaluation..... 15
Ground-water and Leachate Sampling and Analysis..... 15

Background..... 21
History of Facility..... 21
Adjacent Land Use..... 24

Waste Management Units..... 27
Non-Interim Status Regulated Waste Management Units..... 31
Interim Status Regulated Waste Managment Units..... 33
Post November 8, 1985 Waste Management Units..... 42

Facility Operations..... 43
Waste Characterization..... 43
Waste Compatibility..... 46
Disposal Operations..... 46
Waste Location..... 48
Sump/Leachate Monitoring..... 48
Septic System..... 48
Inspections..... 49
Future Operations..... 50

Site Hydrogeology..... 51
Local Physiography..... 51
Local Geology..... 53
Local Hydrology..... 55

Ground-Water Monitoring Program..... 58
Regulatory Requirements..... 58
Pre-Compliance Agreement Monitoring..... 58
Compliance Agreement Monitoring..... 64
Special Studies..... 72

Ground-Water Recovery System..... 78
Trench Drain..... 81
Recovery System..... 81
Recharge System..... 85

Page

TECO Sample Collection and Handling Procedures..... 88
Sampling..... 88
Documentaion..... 91

TECO Sample Analysis and Data Quality Evaluation..... 92
Laboratory Evaluations..... 94

Ground-Water Monitoring Program Proposed for Final Permit.. 103

Evaluation of Ground-Water Task Force Sample Data..... 106

References..... 110

FIGURES

Number	Description	
1	TECO Location Map	23
2	Adjacent Landowners.....	25
3	January 1975, TECO Site Plan.....	32
4	Schematic Flow Chart of Waste Acceptance Procedures.....	44
5	Local Geologic Map.....	52
6	Plan and Cross-Sectional Views of Trenches 1,2, 3,4,5,7,8,9,10, and 12.....	75
7	Plan and Cross-Sectional Views of Trenches 1,2, 3,4,5,7,8,9,10, lnd 12.....	76
8	Plan and Cross-Sectional views of Trenches 6, 13, and 14.....	77
9	Cross Section of Trench Drain.....	82
10	Eductor System Detail.....	83
11	Typical Eductor.....	84
12	Recharge Wells (Pits).....	86
13	Recharge Well Cross Section.....	87
14	Extent of Contamination.....	109

TABLES

Number	Description	Page
1	Task Force Sample Collection and Well/Leachate Location Description.....	18
2	Preferred Order of Sample Collection, Bottle Type and Preservative.....	20
3	Wells within a two mile radius.....	26
4	Solid Waste Management Units at TECO.....	28
5	Comparative Evaluation of the Minimum Technology Requirements (MTR) and TECO Trench 36.....	40
6	State and Federal Counterparts Interim Status Regulations.....	59
7	Monitoring wells, Eductor Wells, Recharge Wells, and Borings at TECO.....	68
D-1	Sample Parameters and Testing Methods.....	D-3
D-2	Field Measurements conducted for GWTF Samples....	D-4
D-3	Summary of Concentrations for Hazardous Substances List of Compounds, Indicator Parameters and Metals Found in Ground-Water Samples at the Texas Ecologists, Inc. Facility, Robstown, TX.....	D-5

ATTACHMENTS

A	1972 Permit.....	A-1
B	Compliance Agreement.....	B-1
C	Facility Plan showing present and future disposal areas, and current monitoring system.....	C-1
D	Analytical Techniques and Results for Task Force Samples.....	D-1
E	Examples of Montly Ground-Water Recovery Reports Submitted by TECO to TWC.....	E-1

EXECUTIVE SUMMARY

INTRODUCTION

Concerns have recently been raised by Congress and the public about whether commercial hazardous waste treatment, storage and disposal facilities (TSDF's) are complying with the ground-water monitoring requirements promulgated under the Resource Conservation and Recovery Act (RCRA).* The ability of existing or proposed ground-water monitoring systems to detect contaminant releases from waste management units has been questioned.

The Administrator of the Environmental Protection Agency (EPA) established a Hazardous Waste Ground-water Task Force (Task Force) to evaluate the level of compliance with ground-water monitoring requirements at commercial off-site TSD facilities and to address the cause of any noncompliance. The Task Force for this facility was comprised of personnel from the EPA Office of Solid Waste and Emergency Response (OSWER), Regional office, and the State regulatory agency.

Currently, 62 TSD facilities are scheduled for compliance inspections of their ground-water monitoring systems. NEIC coordinated and led the first inspection in each of the nine EPA regions having commercial TSD facilities. The Texas Ecologists, Inc. (TECO) facility at Robstown, Texas is the third facility inspected in Region VI and the subject of this project report. It was a regional-lead inspection.

---

* Regulations promulgated under RCRA address hazardous waste management facility operations, including ground-water monitoring, to ensure that hazardous waste constituents are not released to the environment.

The principal objective of the inspection at TECO was to determine compliance with the requirements of 40 CFR Parts 264, 265, Subpart F Ground-water Monitoring and Hazardous and Solid Waste Amendments (HSWA) of 1984. The TECO facility may, in the future, receive waste from Superfund sites where response actions are being conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA-P.L. 96510). Specific land disposal units for Superfund wastes must be in compliance with the Part 265 ground-water monitoring requirements **. Finally, the ground-water monitoring described in the RCRA Part B permit application for the TECO facility was evaluated for compliance with Part 270.14(c).

Specific objectives of the investigation were to determine if:

1. The ground-water monitoring system can immediately detect any statistically significant amounts of hazardous waste or hazardous waste constituents that migrate from the waste management area to the uppermost aquifer underlying the facility.
2. Designated RCRA monitoring wells are properly located and constructed
3. TECO is following an adequate ground-water sampling and analysis plan.
4. Required analyses have been conducted on samples from the designated alternate detection well system.
5. The ground-water recovery system is adequate, and capable of containing the contamination plume.
6. Recordkeeping and reporting procedures for ground-water monitoring are adequate.
7. Characterization of the vertical and horizontal strata under of the site is adequate.
8. Analytical Laboratories utilized by the facility are adequate for conducting required ground-water analyses.

** EPA policy, stated in May 6,1985 memorandum from Jack McGraw on "Procedures for Planning and Implementing Off-site Response", requires that TSDFs receiving CERCLA waste be in compliance with applicable RCRA ground-water monitoring requirements.

The objectives were accomplished by conducting a Reconnaissance Inspection and a Full Field Inspection. The Preliminary Reconnaissance Inspection was conducted January 23, 1986 at the Texas Ecologists, Inc., Robstown, Texas facility. This inspection gave the Task Force the opportunity to familiarize themselves with the facility, meet representatives of the facility and to inform these representatives of the types of samples to be collected, and what information/records they would need to have available for the full field inspection.

Examples of the types of information requested of TECO for the Task Force inspection included:

1. Past activities and uses, including identification of prior releases of hazardous materials, at units that have received or are receiving wastes.
2. Types and volumes of waste received and disposal locations.
3. Man-made barriers to the release of hazardous waste constituents.
4. Site and local geology including cross-sections, drill logs, and potentiometric maps.
5. Ground-water hydrology including flow directions, rates, pathways (natural and man-made) and hydraulic relationships between aquifers.
6. Monitoring well locations and construction.
7. Sampling plan, chemical parameters, and chain-of-custody control, collection procedures (including handling) and equipment.
8. Analysis plan, procedures, data management, and QA/QC controls of the laboratory (ies).
9. All the existing water quality data from ground-water monitoring.
10. Extent of ground-water contamination resulting from previous operations at the site.
11. Current and planned corrective actions.

The full Ground-water Task Force Inspection at the Texas Ecologists, Inc., (TECO) facility began Tuesday, February 4, 1986 and ended Friday, February 14, 1986.

Inspection Participants

EPA Headquarters:	Roy Murphy (Safety Officer)
	Joan Middleton
EPA Region VI:	Deborah A. Vaughn-Wright (Regional Team Leader)
	Julie Wanslow (Document Control Officer)
	David Wineman (Environmental Services Division)
EPA Contractor:	Versan Inc:
	Darcy J. Higgins (Monitoring Specialist Leader)
	Mark McElroy
	Alicia Fleitas
	John Hatcher
Texas Ecologists, Inc.:	William Jones (Facility Manager)
	Patrick Seager (Manager - Regulatory Compliance)
	Charles Mansfield (Chemical Operations Officer)
	Randall Underwood (Professional Engineer)
	Howard A. "Tony" Woods (Chemical Safety Officer)
	Gilbert Avalos (Laboratory Technician)
	Ernest Gazda (Scale House Clerk)
	Rick Retterer (Environmental Well Technician)
Texas Water Commission:	Paul Lewis
	Eric Adidas
	John Dalton
	Mary Ambrose

Acknowlegdements are given to Paul Lewis, Geologist, with the Texas Water Commission in the preparation of this report.

SUMMARY OF FINDINGS AND CONCLUSIONS

The findings and conclusions presented in this report reflect conditions existing at the facility in February 1986. Actions taken by the state, EPA Region VI and TECO subsequent to February are summarized in the accompanying update.

Texas Ecologists, Inc. Robstown, TX facility is not a typical Task Force site in that corrective action was initiated prior to 1980 and their RCRA permit is already in final draft form. Task Force personnel investigated the ground-water programs from prior to November 1980 to the present due to the early initiation of their corrective action. The TECO program(s) are a composite of detection, assessment monitoring, and corrective action being conducted simultaneously. The Task Force therefore began its evaluation with the incontestable knowledge that the ground water beneath the site was contaminated.

Findings and conclusions, specific to selected ground-water program requirements and facility operations are summarized below.

Waste Management Units:

Early management units (trenches 1 through 14) were constructed in native clay soils with little or no compacted clay liner. The first fourteen trenches have the potential for being a continual source of contamination, as the base of at least some of these trenches penetrated the native clay.

Trench 17/18, or the old mixing basin, was identified as a source of contamination during a ground-water assessment study of contamination found in monitoring well W-17 by TECO in 1982. The remedial action chosen was to cap the trench and to leave the contaminated soils and wastes in place. Trench 17/18 is still a source of contamination as is evident from continual elevated levels of contamination found in wells monitoring this area.

Field quality assurance records for the percent of theoretical maximum density conducted during construction of many trenches were reviewed. It was found that even though several samples failed there was no evidence of retesting or correction of the problem. This was not common, but it does raise the question as to trench integrity in some trenches.

Site Characterization:

TECO has conducted several studies in an attempt to characterize the hydrogeology of the site. First as required under the Compliance Agreement, then second as part of the Part B Permit Application. Several areas were found which still require further detail.

A. Monitoring well recharge rates experienced during the inspection were actually very different from those reported. There are several possible explanations:
   1. The data presented is based on textbook values for the type sediments and not actual field calculations;
   2. The well hydraulics have changed due to siltation or failure of the casing or gravel packs since initial calculations; and
   3. Improper tests or test methods were used. Permeabilities presented were based on a bailing test. Quality of a bailing test is determined by the computed aquifer thickness. Because many TECO wells have a sand pack that exceeds their screen length and the aquifer thickness, this could affect bailing test results. Therefore the bailing tests conducted in the past by TECO could be inaccurate.

B. Ground-water flow diagrams presented in the Compliance Plan of December 1985 are not supportable. There are not enough data points to support patterns of flow present in the western and southern areas.

C. Sizable sand lenses have been identified in the Second Clay downgradient of the plume between wells P-13 and P-12. A sand lens in this area could form a vertical migration pathway to the Second Sand if not monitored adequately. Additional monitoring should be conducted in this zone.

Monitoring Well Construction:

Wells installed prior to 1980 often lack lithologic logs and/or well construction diagrams. Records that are availabe show wells with screens and gravel packs of unacceptable lengths, drilling fluids being used, and PVC pipe jointed with glue. Further, during the inspection several of these wells indicated substantial siltation which is indicative of an inadequate gravel pack. Generally all wells installed to prior 1980 do not meet current EPA standards for monitoring well construction. Those wells that are to be used as part of the monitoring system for the RCRA Permit which have the above mentioned problems need to be replaced.

Monitoring wells installed after 1980 and as part of the 1981 Compliance Agreement had more detailed lithologic and well construction details recorded. The wells still contain much of the same problems however, in the areas of excessive screen and sand pack lengths. Construction materials used did improve with time. As with the pre-1980 wells these wells should also be closely re-evaluated and replaced if inadequately constructed prior to integration into the RCRA permit monitoring system.

Ground-Water Monitoring Systems:

The ground-water monitoring program at TECO is considered an alternative monitoring system. The system consists of compliance point wells for the plume of contamination, background wells, wells designated as being outside the area of contamination, wells considered inside the area of contamination, and point of compliance wells for the facility waste management area.

Ninety-three wells are monitored on a monthly basis for pH, chemical oxygen demand, total organic carbon, specific conductivity, water level odor and appearance. The location and parameters selected for these wells are based on the TECO designated boundaries of the plume of contamination and the requirements for monitoring specified in the 1981 Compliance Agreement. TECO has complied with the 1981 Compliance Agreement and has installed and monitored the wells as specified.

The Task Force feels that even though TECO was granted alternative monitoring program status and was compliant with the 1981 Compliance Agreement an assessment/detection monitoring program for the waste management areas seperate of the compliance monitoring conducted for the identified plume of contamination must be initiated based on investigation results. Essentially, due to two upgradient areas (southeastern and western portion of the facility) units 35, 36, 37, and 28 are not sufficiently monitored. A release from these units would not be immediately detected.

Sample Collection and Handling:

TECO has dedicated PVC bailers to sample the monitoring wells. It was found that these bailers were modified by the facility and equipped with a PVC filter to prevent silt from clogging the bottom valve. This attachment was often glued onto the bailer then secured with a metal bolts.

Equipment of this type is not adequate for detection or assessment sampling purposes. PVC should be used only for purging. The Task Force recommends the use of bailers constructed of inert materials with bottom release valves or gas displacement pumps so as to prevent agitation of the sample which could in turn cause volatization of the sample. Sampling handling, preservation, documentation, and shipping methods observed followed EPA standards.

Laboratory and Sample Data Quality Evaluation:

TECO utilizes three laboratories on a regular basis: (1) on-site laboratory, (2) U.S. Ecology Central Corporate Laboratory, and (3) Jordon Laboratory. There are other laboratories used on a special contract basis. The Task Force evaluated the U.S. Ecology Central Corporate Lab. because they analyze the monthly water samples and Radian Laboratories at Austin because they analyzed the splits collected by TECO from the Task Force.

The U.S. Ecology Central Corporate Laboratory was found to have several minor deficiencies relating to holding times (pH, and TDS) and methodologies (TDS,COD, and TOC) However, in general, the laboratory appears to be providing acceptable quality data.

The implementation of the U.S.Ecology Central Corporate Laboratory Ground-Water Analysis Plan would initiate a quality assurance program that would in turn strengthen the quality of data. The ground-water analysis plan should be implemented.

Radian Corporation in Austin, TX was also evaluated. The Task Force found that Radian met the requirements of their contract with Texas Ecologists and the data produced under this contract is of acceptable quality. The quality control specified in the contract should have been more explicit.

Ground-Water Recovery System:

The ground-water recovery system at TECO consists of three areas of operation, 1) the trench drain, 2) recharge pits/wells, and 3) recovery wells. The system is designed to curtail a plume of contamination based on TOC values that formed as a result of releases from closed surface impoundments and the capped mixing basin.

A review of the recovery system found that it should be able to curtail further movement of the TOC plume of contamination. Potentiometric maps of the area over the years have shown that a cone of depression is forming and that wells lying outside of the plume have had a decrease in TOC values. Questions still remains on whether the system will achieve the required results within a time frame to be detailed in the permit and if the current system is adequate in addressing the Appendix VIII constituents found within the boundaries of the current plume of contamination and elsewhere on the TECO facility during the Task Force sampling.

Task Force Sample Data

Sample data collected during the February 1986 Task Force inspection confirms the presence of extensive contamination in the area of the closed surface impoundments and capped old mixing basin. Contamination detected in monitoring well W-21, which monitors both trench 17/18 (old mixing basin) area and a portion of the original 14 trenches, was quite extensive. Sixteen organic compounds of substantial levels, six inorganic constituents above Primary Drinking Water Standards, and elevated indicator parameters were detected. This would indicate a need for expanding the current ground-water recovery system in this area.

Various levels of contamination were found in areas of the TECO facility which had not previously been addressed by the 1981 Compliance Aggreement. This newly detected contamination was found in three areas:

1. Monitoring wells W-6 and 001 which are west and upgradient of the plume of contamination, yet downgradient of the western trenches, contained elevated concentrations of organic and inorganic compounds.

2. Six wells adjacent to the first fourteen trenches were sampled and all contained various levels of contamination indicating a release(s) stemming from these trenches.

3. Low levels of metals and several indicator parameters were detected north and downgradient of the plume of contamination. The presence of this contamination indicates the need of assessment north of the plume and further monitoring downgradient.

TECHNICAL REPORT

Investigation Methods

The Task Force investigation of the Texas Ecologist, Inc. facility consisted of:

- Reviewing and evaluating records and documents from EPA Region VI, Texas Water Commission, and Texas Ecologists, Inc.
- Conducting a reconnaissance inspection January 23, 1986 and a full-facility inspection February 4 through 14, 1986.
- Evaluating on-site and off-site analytical laboratories.
- Sampling and analyzing data from selected ground-water monitoring wells and leachate collection sumps.

Records/Documents Review:

Records and documents from EPA Region VI and TWC offices, compiled by an EPA contractor, were reviewed prior to and during the on-site inspection. Additional TWC records were copied and reviewed by Task Force personnel concurrently with the reconnaissance inspection. On-site facility records were reviewed to verify information currently in Government files and to supplement Government information where necessary. Selected documents requiring in-depth evaluation were requested from the facility by the Task Force during the inspection. These documents were provided by TECO upon request. Records were reviewed to obtain information on operations, construction details of waste management units and the ground-water monitoring program.

Specific documents and records that were reviewed included the ground-water sampling and analysis plan(s), the RCRA Part B Application, analytical results from past ground-water sampling, monitoring well construction data and logs, site geologic reports, site operational plans, facility permits, designs of waste management units, and position descriptions and qualifications of selected personnel and operating records showing the general types, quantities and locations of wastes disposed at the facility.

Task Force Inspection:

The inspection conducted in February 1986 included identifying waste management units (past and present), waste management operations, pollution control practices, surface drainage routes, and verifying the location of ground-water monitoring wells and leachate collection sumps.

Company representatives were interviewed to identify records and documents of interest, discuss the contents of the documents, and explain (1) facility operations (past and present), (2) site hydrogeology, (3) the ground-water monitoring system, (4) the ground-water sampling and analysis plan, and (5) laboratory procedures for obtaining data on ground-water quality.

Laboratory Evaluations:

The on-site and off-site laboratory facilities handling ground-water samples were evaluated regarding their respective responsibilities under the TECO ground-water sampling and analysis plan. Analytical equipment and methods, quality assurance procedures and records were examined for adequacy. Laboratory records were inspected for completeness, accuracy and compliance with State and Federal requirements. The ability of each laboratory to produce quality data for the required analysis was also evaluated.

Ground-Water and Leachate Sampling and Analysis:

During the inspection Task Force personnel collectd samples for analysis from 22 ground-water monitoring wells and 3 leachate collection sumps (Table 1) to determine if the ground-water contains hazardous waste constituents and to verify previous sampling data.

Sampling locations were selected based on past monitoring records, well logs, and hydrogeologic reports. The leachate sumps were selected based on proximity to units of interest and wells being sampled.

All samples were collected by EPA contractor personnel with splits of selected samples being provided to the facility and State. The wells were sampled with 2-inch teflon bailers with teflon coated stainless steel cable. Three wells required the use of submersible pumps for purging, both TECO and EPA owned pumps were used. Samples were collected from the wells using the following protocol:

1) EPA contractor personnel monitored open well head for chemical vapors and radiation.
2) EPA contractors, accompanied by TECO personnel, determined depth to ground water and total depth using an interface probe.
3) EPA contractor personnel calculated height of water column.
4) EPA contractor personnel calculated three casing volumes.
5) EPA contractor personnel purged the calculated three casing volumes. Rapidly recharging wells were purged for three full casing volumes, whereas slower wells were purged to dryness once. Purge water and excess sample water were placed in drums, then disposed in pond 26.
6) Samples were collected with a bottom filling teflon bailer supplied by the EPA contractors.
7) A sample aliquot was collected and field measurements (water temperature, pH, specific conductance) taken.
8) EPA contractor using alternating method filled sample containers in the order shown in Table 2.
9) Samples were then placed on ice in an insulated container and taken to the EPA staging area.

When sampling was completed at each well, the samples were taken to the EPA staging area. Turbidity measurements were taken and one of the two sample aliqoats was filtered for metals analysis. Metals, TOC, phenols, cyanide, nitrate and ammonia samples were preserved, (Table 2).

The monitoring well samples were packaged and shipped to two EPA contract laboratories as environmental samples in accordance with Department of Transportation (DOT) regulation (40 CFR Parts 171-177).

Leachate samples were all collected and shipped the same day to prevent possble cross contamination through handling with other well samples and shipping. These samples were considered medium hazard concentration and were shipped according to DOT regulations. All EPA contractor personnel wore full-face respirators and protective clothing. TECO personnel assisting in leachate sample collection wore half-face respirators and tyvecks®. Plastic sheeting was laid around each sampling point in order to prevent area contamination in case of spillage. Spillage at Sump 33 did occur when the connecting hose from the sump pump to the sampling valve became disconnected due to high pressure build up in the lines. The liquid and contaminated soil were placed in a drum for disposal and the National Spill Response Center was notified.

Three field blanks for each analytical parameter group (e.g., volatiles, organics, metals) were prepared near monitoring wells p-8, 001, and W-21 so as to represent field conditions. One equipment blank was prepared by running distilled, deionized water through the apparatus used to filter metals. One set of trip blanks for each parameter group was also prepared. The blanks were submitted to the EPA lab as samples with no distinguishing labeling or markings.

Samples were analyzed by EPA contractor laboratories (Centec, Salem, WA for inorganics; Compu/Chem, Research Triangle Park, N.C. for organics) for the parameters shown in Table 2. An analysis of the sample results will follow.

® Registered trademark of E.I. DuPont de Nemours and Co.

Table 1

TASK FORCE SAMPLE COLLECTION AND WELL/LEACHATE LOCATION DESCRIPTION

Well	Sampling Date	Sampling Time	Remarks	Location/Description
P8	2/6	1516- *	Slight chemical odor, slightly turbid; EPA bailer lost in well	East of Trench 6
P7	2/6	1730-2000	Very turbid - difficult to filter	Designated upgradient well; south of facility
W1	2/6	1640-1755	Clear to cloudy water; no apron present at wellhead	Upgradient of old trench area;East of Trench 13
P2	2/7	1303- *	Outer casing does not extend below apron, inner casing broken	So.of Trench 36 and 37; East of drainage canal
P4	2/7	1215-1415		Downgradient; South of Trench 28
P5	2/7 2/8	1707- 0945	Turbid; due to lack of volume sampling took two days;VOAs thru Dioxins sampled 2/7; metals thru SO_4/CL^- sampled 2/8;loose casing	Downgradient; south of Trench 29
W16	2/8	1100-1200	Rusty screws in dedicated bailer	Upgradient; west of active trenches
W15	2/8	1150-1245	Sampled before full recharge	Upgradient; west of active trenches
W21	2/8	1630-1735	Yellowish brown-green color; strong chemical odor; 3ppm on OVA reading of water sample	Southwest of Trench 8
W6	2/10	1330-1500	QA/QC Duplicate	West of Plume
P9	2/10	1430-1530		Crossgradient of Trench 1 and 2
E3	2/10	1125-1221	Dark brown-black color; strong sewage odor.	NE of Trench 21; inside '85 plume boundary
E48	2/11	1353-1517	No apron at wellhead	NE of '85 plume boundary
001	2/10 2/11	1630- 0858	Due to lack of volume collected VOAs thru Pesticides 2/10, collected remainder 2/11	Downgradient of Trench 36
P12A	2/11	1540-1620	Slightly silty	South edge of North ground-water mound
P13	2/11	1310-1425	Facility bailer used for purging only, left in well during recovery	North of '85 plume boundary
E36	2/12	1515-1615	Black to clear color as well was sampled; slight odor	Deep upgradient well

* Ending times were not recorded

Table 1 (continued)

Well	Sampling Date	Sampling Time	Remarks	Location/Description
E41	2/12	1415-1518	Purged with 2 5/8 inch submersible pump; no apron	North of '85 plume boundary
E14	2/12	0910-1018	Purged with 4 inch Jacuzzi submersible pump	East of Trench 40
OB2	2/12	0933-1120	Used facility bailer to purge, bailer left in well during recovery period; apron cracked	Near northern facility boundary
P6	2/13	1030-1145	Slightly silty; animal burrow under apron	
W2	2/13	1115-1220	No apron;	Southwest of Trench 15
LEACHATE WELLS				
S33	2/14	1120-1219	Moderately clear then turned green to black, 400 ml beakers used as intermediate containers for VOAs; 2-l liter beaker used for other parameters	East end of Trench 33
S16	2/14	1236-1304	Color brown; OVA 60-80 ppm in casing, 14-18 ppm in sample; 2-l liter beaker used as intermediate container	Trench 16
S1	2/14	0852-1026	Oily smell, viscose dark oily brown	NW end of Trench 1

Table 2

PREFERRED ORDER OF SAMPLE COLECTION,
BOTTLE TYPE AND PRESERVATIVE LIST

Parameter	Bottle	Preservative
1. Volatile Organic Analysis (VOA)		
Purge and Trap	2 - 60-ml VOA vials	
Direct Inject	2 - 60-ml VOA vials	
2. Purgable Organic Carbons (POC)	1 - 60-ml VOA vial	
3. Purgable Organic Halogens (POX)	1 - 60-ml VOA vial	
4. Extractable Organics	4 - 1-qt. amber glass	
5. Pesticide/Herbicide	1- 1-qt. amber glass	
6. Dibenzofuran/Dioxin	1-qt. amber glass	
7. Total Metals	1-qt. plastic	HNO_3
8. Dissloved Metals	1-qt. plastic	HNO_3
9. Total Organic Carbon (TOC)	4-oz. glass	
10. Total Organic Halogens (TOX)	1-qt. amber glass	
11. Phenols	1-qt.amber glass	H_2SO_4
12. Cyanide	1-qt. plastic	NaOH
13. Sulfate/Chloride	1-qt. plastic	
14. Nitrate/Ammonia	1-qt. plastic	

BACKGROUND

HISTORY OF FACILITY:

Texas Ecologists, Inc. operates a 240-acre Class I Industrial Solid Waste Management facility located approximately 1/2 mile south of FM Road 892 and one mile east of the intersection of FM Road 892 and FM Road 2826, approximately 3.5 miles south of Robstown, Nueces County, Texas. (Figure 1)

Permit #39023 was issued by the Texas Water Quality Board under the authority of Article 4477-7, Vernon's Texas Civil Statues, and Texas Water Quality Board Order 71-0820-18 on July 19, 1972 after public notice and hearings in Austin on February 29, 1972. (Attachment A)

Initial operations as specified in the registration were to include: 1. reclamation and salvage of oils and other hydrocarbons; 2. Incineration of oils, solvents, hydrocarbons, grease and other combustible liquids; 3. chemical treatment of acids, caustic, and other chemical solutions; and 4. modified landfill of solid wastes and solids and sludges resulting from the treatment process. Only incineration has never been conducted at this facility. TECO was classified as a Class I landfill which could accept oils, solvents, and other hydrocarbons; acids, caustics, and other chemical solutions including those containing heavy metals; mud-water-oil mixtures; and other solids and semi-solid wastes. No site characterization or ground-water monitoring was required under this original permit.

The Texas Solid Waste Disposal Act of 1977 when passed required ground-water monitoring and site characterization, therefore under this new act ground-water monitoring began at TECO. Between 1977 and 1980 a new permit was drafted and public hearings were held. However, due to the passage of RCRA, it was decided by TWC to table the new permit in favor of issuing another permit under the new Federal Act.

During the installation of the first series of ground-water monitoring wells in late 1977, contamination was detected and through subsequent studies a plume was identified within the boundaries of the facility. The source of the plume was determined to be either from a breach in the liner of pond 2 or the Old Mixing Basin.

A Compliance Agreement between TECO and TWC was entered on February 26, 1981 in recognition of the need for further investigation and appropriate corrective action (Attachment B). The 1981 Compliance Agreement required that pond 2 and the other ponds 1, 3, and 4 be drained, cleaned, and then capped. The mixing basin, which was also a suspected source, was also capped.

TECO initiated ground-water assessment and developed a ground-water recovery system under the guidance of TWC. The recovery system was basically designed to capture the plume.

It was evident by December 1981, the recovery system was not developing the desired cone of depression sufficient to capture the contamination plume. Therefore in order to increase the rate of ground-water recovery and aid in abatement, a trench drain (4x4x520 ft.) was installed across former ponds #2, 3, and 4. All recovered ground water was pumped to an 80,000 gallon equalization tank for temporary storage prior to treatment by an activated sludge system and secondary filtration, and then finally for disposal into evaporation Pond 26.

Current operations consist of the disposal for hazardous wastes, recovery, and treatment of contaminated ground water, and compliance point monitoring. During the inspection TECO was operating under RCRA Interim Status Authorization (EPA I.D. # TXD069452360), TWC registration (# 39023), and a 1981 Compliance Agreement with TWC. A draft RCRA Hazardous

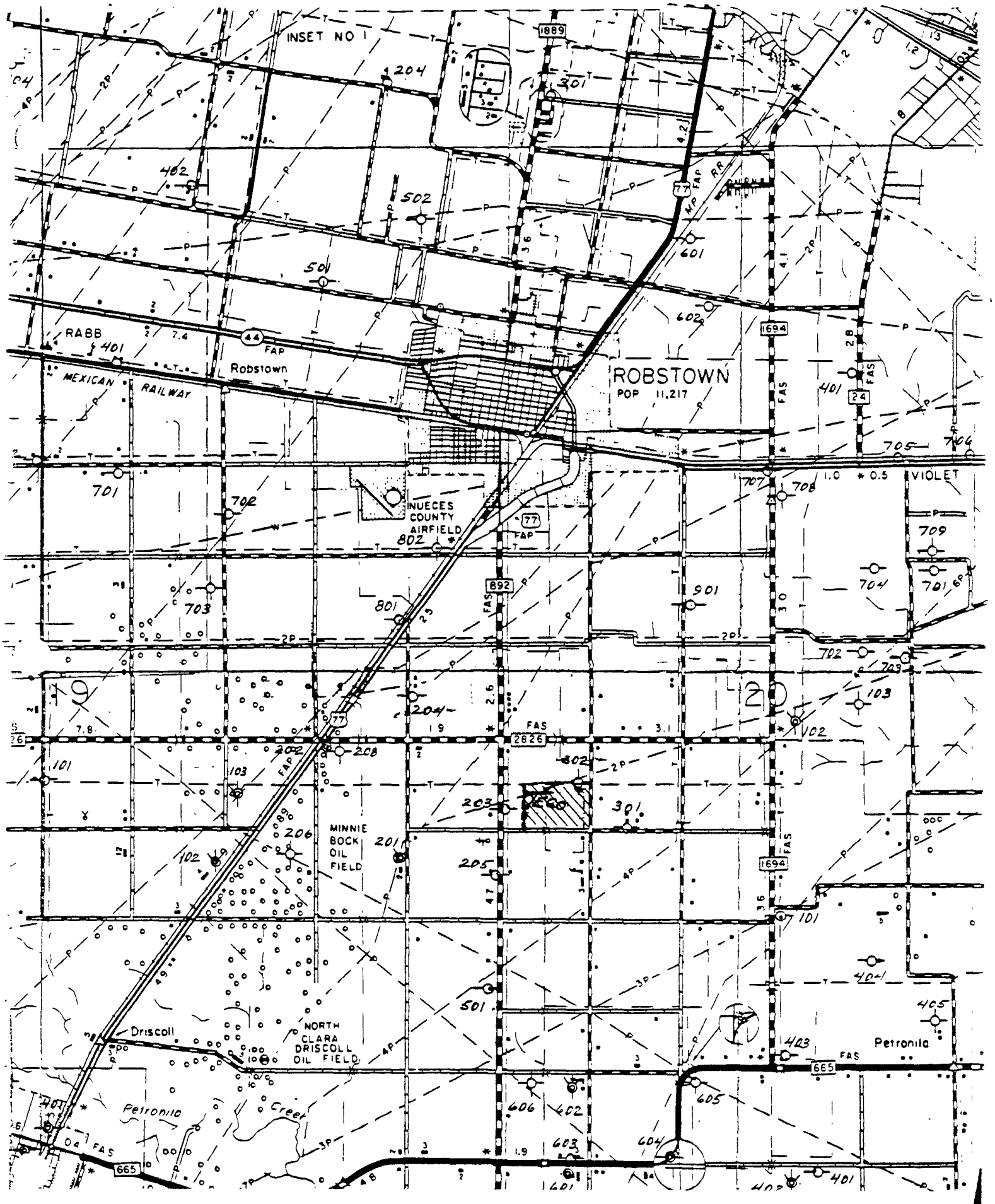


Figure 1 Location of Texas Ecologists, Inc., near Robstown, Texas.

Waste Permit, # HW50052, has been prepared with public review pending. The latest revised Part B Permit Application was submitted November 8, 1985 and a Ground-water Compliance Plan Application was submitted December 1985.

Adjacent Land Use:

Land adjacent to the TECO facility is currently being used for agricultural purposes and sparsely populated residential dwellings and oil and gas field development. A small oil and gas field is located 0.5-mile east of the site. Further, several wells were drilled, plugged, and abandoned in 1959 - 66 on site. The nearest house is located at the northeast corner of the site, and is owned and leased by TECO. Other residences are located a quarter mile or more around the site. Figure 2 is a location map of the facility showing the site and adjacent landowners.

The TECO facility is located approximately four-miles south of Robstown, which is the only major population center near the facility. A conservative estimate of the population surrounding the facility in a three-mile radius would be 200 individuals. (This figure does not include the Robstown population).

Table 3 is a partial list of drinking and irrigation wells within a two mile radius of the facility. Twenty-seven local wells were analyzed by the Texas Water Commission in July 1979 and tested for ion balance, total dissolved solids, pH, total organic carbon, E_c, and iron. Further bacteriological data was collected, and field data recorded on odor, taste, appearance, pH, E_c, temperature and dissolved oxygen. The ground-water data collected did not indicate any contamination at that time. Since 1979 there have been no other testing of residential or irrigation wells around TECO, except for a private well for drinking water belonging to W.A. Aldrich, which was sampled per his request in 1981. That test showed no detectable change from the earlier test conducted in 1979 and was evaluated as not contaminated.

FIGURE 2

ADJACENT LANDOWNERS

1. Kenneth Ahlrich
   Route 2
   Robstown, TX 78380
2. Evelyn L.Humphries
   Rte.2, Box 26
   Robstown, TX 78380
3. Vannie B.Mattiza Mayo
   103 E.Ligustrum St.
   Robstown, TX 78380
4. Mrs.H.A.Miller,Jr.
   P.O.Box 252
   Boerne, TX 78006
5. Faye McCrary Salyer
   Rte.3, Box 268
   Robstown, TX 78380
6. W.A.Ahlrich
   Rte.2,Box 22
   Robstown, TX 78380
7. Frank Bradshaw
   4650 Calvin St.
   Corpus Christi, TX 78411
8. William C. Bersen
   Rte.2, Box 591-A
   Corpus Christi, TX 78410
9. J.T.Kircher,Jr.
   Rte.3, Box 127-A
   Robstown, TX 78380
10. Hiram Welty
    318 Kissling
    Robstown,TX 78380
11. Kenneth Ahlrich
    Rte.2
    Robstown, TX 78380

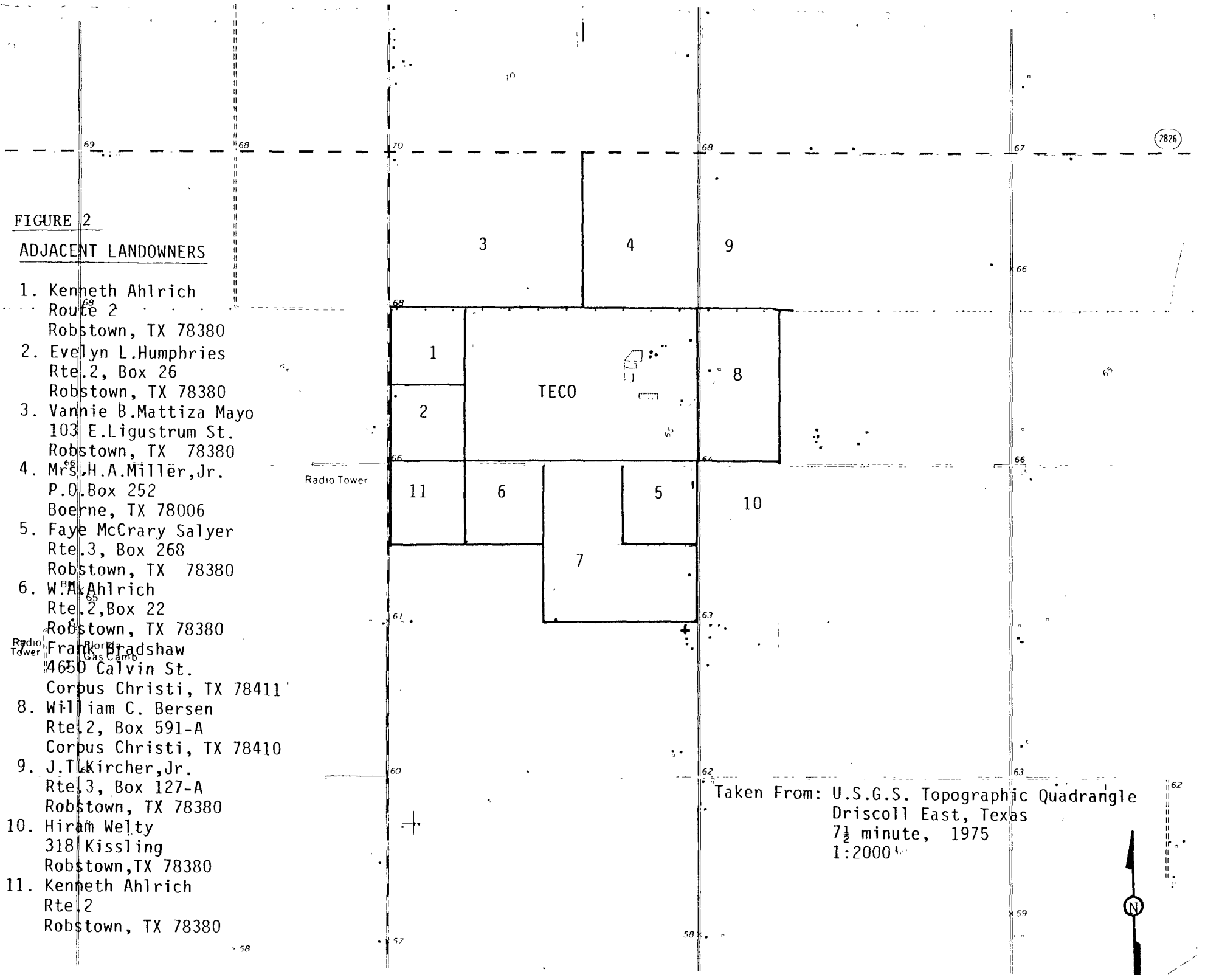


TABLE 3

Wells within a 2 mile radius of the TECO Robstown, Texas facility

Well #	Owner	Date Completed	Depth (ft)	Water Use *	Location
201	Coastal Transmission	1958	500	Drinking/Industrial	
203	G.B.Humphries	1920	170	Unknown	
204	R.L.Cooper	1943	242	Drinking	
205	Ransom	1945	322	Drinking	
301	A.Merritt	1965	368	Drinking **	
302	E.O.Miller	1960	8026	oil test	
501	W.R.Schneider	1945	325	Drinking/Yard Irrigation	2 mile south of TECO
3a	A.P.Johnson	1969	271	Drinking	
3b	D.L.Kircher	1977	387	Drinking	
	W.A.Aldrich	1956	345	Drinking	1/2 mile West of TECO
	Kennith Aldrich	1976	300	Drinking	1/2 mile West of TECO
	Kennith Aldrich	1952	325	Drinking	1 1/2 mile West of TECO
	Walt Talley	<1940	350-400	Yard Irrigation ***	1 mile South of TECO
	Mrs. Routh	1984	350-400	Yard Irrigation ***	1 mile Northeast of TECO
	K.Busenlehher		439		
	R. Cardwell	1972	385		
	R. Gonzales	1966	369		
	W. Grote	1973	345		
	M.L. Rauch	1956	298	Windmill	
	D. Saenz	1975	367		
	D. Salyer	1960	377		
	B. Schneider	1965	359		
	H.W. Schneider	1952	360		

* All wells are set in the Gulf Coast Aquifer
** Sand at 240' contain more total solids than 360' sand
*** Reported saline and not suitable for drinking

WASTE MANAGEMENT UNITS

The TECO facility handles hazardous waste as defined in the Texas Administrative Code (TAC) Section 335 and is regulated by the Texas Water Commission and EPA. Waste handling units and operations were identified to aide in evaluating where waste constituents handled at TECO may enter the ground water.

TECO currently uses the following management units/areas for the treatment, storage, and/or disposal of hazardous wastes:

- Landfills - disposal
- Surface Impoundments - storage and treatment
- Tanks - water treatment
- Drum Storage Areas - container storage.

Past operations have also included experimental waste disposal by "Terra Gator ®", experimental heavy-oil land farming, and multiple surface impoundments for the storage of bulk-liquid oily wastes.

A discussion of waste management units related to ground-water monitoring at the TECO facility follows. These discussions are divided into three time frames:

(1) Units operated and closed prior to when RCRA/TAC interim status regulations were enacted in November 1980.
(2) Units in operation between November 1980 and November 1985 which are subject to RCRA/TAC interim status requirements.
(3) Units that fall under Minimum Technology Requirements as set by HSWA.

Table 4 lists the solid waste management units at TECO.

® Terra Gator is a registered trade name.

Table 4

Solid Waste Manegement Units at Texas Ecologists, Inc.

UNIT NAME	RCRA	STATUS	DATE	CAPACITY *	RELEASE	WHEN	WHERE	COMMENTS
LANDFILL TRENCH #1	No	Closed	Pre '80	18667 CY	Unknown			Trenches lined with native clay. Release potential high to GW. No specific release has been verified from these units.
2	No	"	"	23333 CY	"			
3	No	"	"	23333 CY	"			
4	No	"	"	32667 CY	"			
5	No	"	"	32667 CY	"			"
6	No	"	"	32400 CY	"			"
7	No	"	"	19833 CY	"			"
8	No	"	"	19833 CY	"			"
9/10	No	"	"	54833 CY	"			"
11	No	"	"	22166 CY	"			"
12	No	"	"	22166 CY	"			"
13/14	No	"	"	34800 CY	"			"
15	No	"	"	34833 CY	"			"
16	No	"	"	34833 CY	"			"
20	No	"	"	99667 CY	"			"
23/24	No	"	"	100267 CY	"			"

Table 4 continued

UNIT NAME	RCRA	STATUS	DATE	CAPACITY *	RELEASE	WHEN	WHERE	COMMENTS
Landfill Trench 25	No	CLOSED	"	82867 CY	"			"
32	† Yes	"	1/81	88500 CY	"			Trenches lined with compacted native clay.
30	Yes	"	1/83	87400 CY	"			No specific release has been verified.
34	† Yes	"	1/81	81700 CY	"			Trenches have leachate collection system.
31	† Yes	"	3/82	68400 CY	Unkown			"
27	Yes	"	8/82	88200 CY	"			"
33	Yes	"	4/83	74100 CY	"			"
19	Yes	"	2/84	93916 CY	"			(Trench located over old impoundments 2,3, & 4)
28	Yes	"	1/83	81900 CY	"			SAME AS #32
35	Yes	"	85	76533 CY	"			"
36	Yes	Active	-	-	"			Double lined with clay and synthetic; however sides do not meet MTR
37	Yes	Under Construction	-	-	-			Liner meets MTR
SURFACE IMPOUNDMENT #1	No	Closed	11/79	2.01MM Gal.	Yes	75-77	GW	Contaminants detected
2	Yes	"	8/82	3.40MM Gal.	Yes	75-77	GW	1977 during monitoring well installation
3	† Yes	"	3/82	1.84MM Gal.	Yes	75-77	GW	

Table 4 continued

UNIT NAME	RCRA	STATUS	DATE	CAPACITY *	RELEASE	WHEN	WHERE	COMMENTS
Surface Impoundment 4	† Yes	"	3/82	3.60MM Gal.	Yes	75-77	GW	old impoundments.
new 3	Yes	"	6/85	4.3MM Gal.	Unknown			
26	Yes	Active	-	7.30MM Gal.	Unknown			Lined with synthetic and clay
30	No	Closed	7/80	3.10MM Gal.	Unknown			
Mixing Area (AKA Trench 17/18)	No	Closed	Pre '80	Unknown	Yes	'77 ?	GW	Bulk liquids mixed silty sand by backhoe
Storage Tank M-1	Yes	Active	——	80000 Gal.	NO			stores ground water prior to treatment
Tanks M-2 thru M-6	Yes	Active	——	20000 Gal.ea.	NO			treated water storage tanks

Capacity figures represent total volume of trench, waste utilization is approximately 35%
Gal.: Gallons
CY.: Cubic Yards
† Units closed prior to November 8, 1980 are termed pre-RCRA units. However, units closed between November 8, 1980 and July 26, 1982 are termed non-RCRA-regulated Solid Waste Management Units that are RCRA regulated but not subject to 40 CFR §264.100 Subpart F.

Pre-Interim Status Regulated Waste Management Units:

Waste management units and activities operated before November 19,1980, which are not subject to the TAC interim status ground-water monitoring requirements, are potential sources for release of hazardous waste constituents to ground water.

Between 1972 and November 1980 nineteen landfill trenches, two surface impoundments, and one mixing trench were activated, used, and removed from service. The hatched portion of Attachment C shows the location of these units.

The first fourteen trenches used at TECO for waste disposal were rectangular cells constructed in native clayey soils.Though early design drawings indicated clay liners were to be installed, with the possible exception of trench 1, the first fourteen trenches had no liner or leachate systems installed. Each trench, though never surveyed, is believed to be 15-feet in depth, 100 feet wide and 225 feet long. Various correspondance reviewed in the TWC files indicate trench depths anywhere from 9 to 17 feet.

These early trenches hold a full range of wastes (as defined by 40 CFR 261, with the exception of reactive wastes) including drummed liquids and solidified liquids/sludges. The drums were disposed on their sides in layers five deep with fill dirt between each layer.

These trenches were completed in a 'leap frog' fashion. Excavated soils were stored adjacent to the active trench and were often used either as fill or as an absorbent mix for liquid/sludge. Figure 3 is a drawing of the facility dated January 1975. It illustrates trench development and usage. Each trench was closed with a clay cap 18 to 24 inches thick and seeded for vegetation.

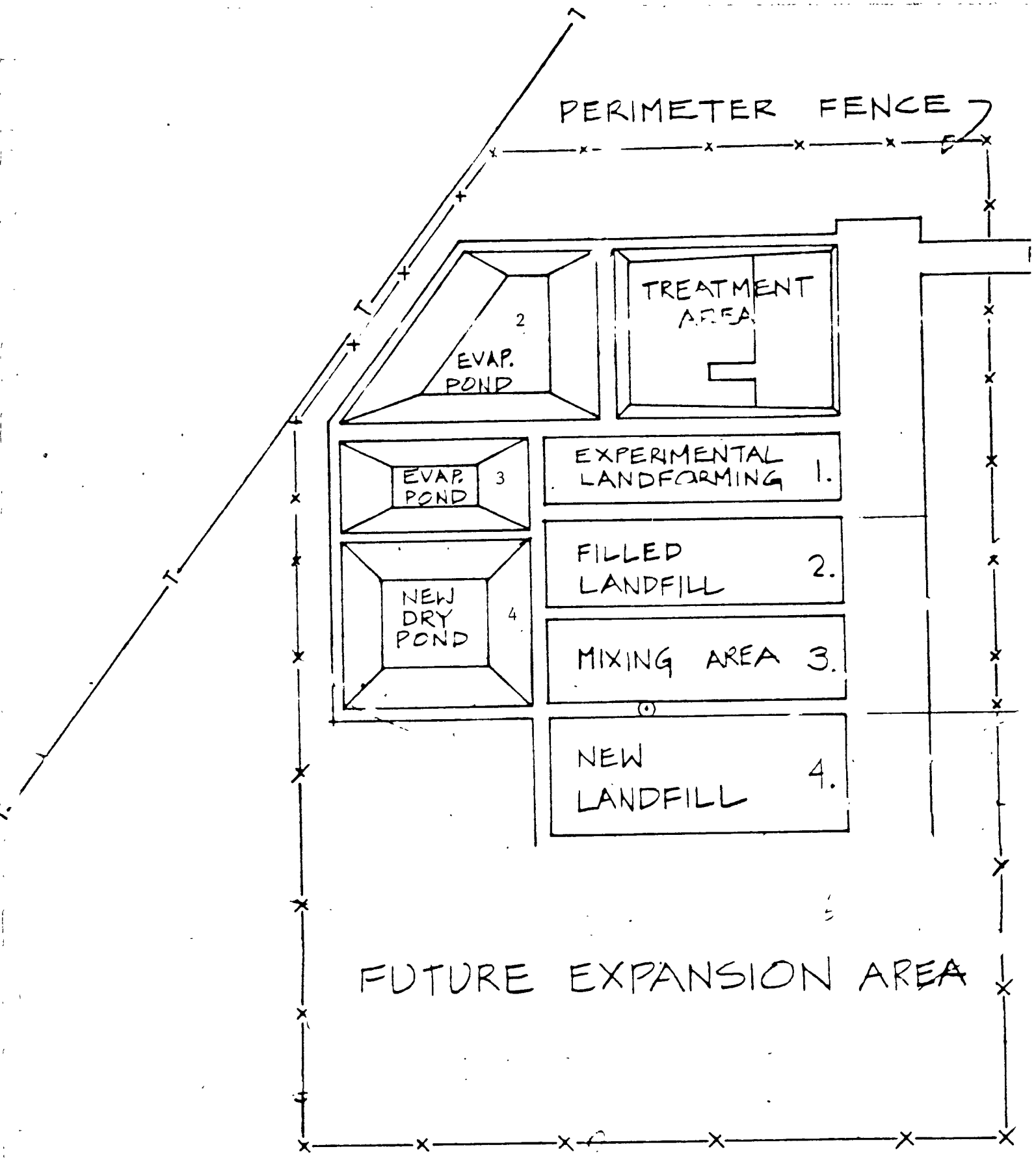


FIGURE 3 January 9,1975 Texas Ecologists, Inc. Site Plan
Approximately 1"=150'

From: 1975 Robstown System Expansion Engineering Drawings

The next series of trenches were constructed with a compacted clay liner of reportedly 10^{-7} cm/sec permeability due to encountering water during the construction of trench 15/16.

All wastes placed in trenches, were segregated into three chemically compatible cells. The compatibility groups are:

A	B	C
Oxidizers	Bases	Organic Solvents
Inorganic Acids	Reducers	Organic Acids
	Cyanides	Aldehydes
	Heavy Metals	Alcohols
	Pesticides	General Organics
		Inerts
		Saturated Hydrocarbons
		Unsaturated Hydrocarbons

Depending on the waste types and quantities received trenches may contain more wastes of one group than another. Each compatibility cell within a trench was segregated by a three-foot wall of clay.

Trench 33 was used as an experimental trench for the disposal of liquid wastes to assure stabilization in the soil as well as minimize odor emissions. The experimental process utilized a tractor equiped with a 3,000-gallon tank, vacuum and pressure capabilities and subsurface injectors to mix liquid with soil at a depth of 17-inches. The system was referred to as a "Terra Gator".

Initial usage of the system took place between September 1980 and January 1981, at which time a demonstration was held for TWC and TACB district representatives. Reaction by Texas regulatory authorities was favorable because the system appeared to control odor emissions.

Problems soon developed with the soil load capacity and with the presence of excessive liquids accumulating in the leachate collection

system. It was calculated that at one point 8-feet of liquid existed in the liner/leachate system. The Terra Gator was therefore judged by TWC to be an ineffective method of liquid waste disposal and constituted a potential release mechenism to the ground water. TECO was then ordered to cease using the Terra Gator in 1982.

Mixing trench 17/18 was an open trench used solely for mixing liquid or sludge wastes with sands and clays prior to disposal. Exact dates of operation are unknown. However, it is believed to have been filled with contaminated material and closed between 1978 and 1980. A release of contaminants has been attributed to trench 17/18. The assessment study conducted is decribed later in this report.

Pond #1 was the first of the four original surface impoundments and was closed in November 1978. The pond was used solely for overflow from pond 2. Closure was performed by evaporation of liquids; the clay liner was then removed to then active trench #25, and the depression backfilled. It is not known if any analytical tests were performed to assure complete removal of hazardous constituents.

Pond 30 was developed as a result of a 1978 hurricane. Trench 30 was half-full with wastes when a hurricane flooded the site area. The remaining west half was converted into a pond, a divider wall constructed and the last half of trench 30 was capped. Liquids received were contaminated storm waters and water transferred from pond 2 which had been treated by the Calgon Unit®. Use of the pond continued until July 1980. Even though not in active use after that time, the pond remained open with liquid until pond #26 was completed. Therefore pond 30 is considered a RCRA unit.

® Calgon is a registered trademark

As part of the Compliance Agreement (Attachment B) pond #30 was closed and the liquids transferred to the new pond 26. Liquids were transferred in 1982 and by fall 1983, the clay liner removed and deposited in trench #19. The leachate collection system was rebuilt along with the barrier between the trench and pond portions. The remaining half was never utilized for waste disposal but was backfilled with clean soil. A final clay cap was installed over the entire Trench/Pond 30 area in December 1983.

Interim Status Regulated Waste Management Units:

Nine landfill trenches were activated between November 1980 and November 1985. They were trenches 32, 34, 31, 27, 28, 30, 33, 19, and 35. Even though they all only used compacted clay as the primary liner material, trench construction techniques and design appear to have progressively improved with time. The trenches typically have been 600 feet long, 200 feet wide, and a maximum 25-feet deep (5-feet above historical high ground-water table), and have a base of three feet of compacted clay as a liner.

Compacted clay diversion dikes were constructed around each trench while it was active to prevent the run on of surface water and to prevent the run off of potentially contaminated waters.

Trench floors and leachate collection systems were graded towards the low end of the trench where a sump area was constructed. Leachate collection systems have typically consisted of twelve inches of sand with a drain field of four-inch PVC pipe connected to a 1000 gallon reservoir pipe and riser pipe.

The trenches were capped with a final backfill over the wastes and a compacted clay cap. Prior to 1983 final caps were sloped to drain in a sheet pattern. Caps constructed since that time are graded to a center crown with a slope to either side. Eighteen inches of uncompacted soil covers the clay cap to support vegetation.

Ponds 1,2,3, and 4 were the original surface impoundments planned by the facility to handle bulk liquids, oily wastes, storm-water runoff, and spill disposal. Pond 2 was the first surface impoundment constructed in 1973. Ponds 3 and 4 were later built to receive excess from pond #2. Finally in 1977-78, pond 1 was constructed to receive runoff from pond #2. Only pond #1 was closed prior to November 1980.

1978 was the peak period of the ponds being used as waste handling areas. Pond 3 was being used as the primary receiving pond, where oily wastes were skimmed off and recycled whenever possible. Liquid from pond 3 was then transferred to either pond 2 or 4 for evaporation. Pond 1 was only used for overflow from pond 2.

All four ponds were approximately 10-12 feet deep with compacted clay on the sides and floor. Cells were sloped 2:1 on north-south walls and 4:1 on east-west walls.

The ponds were dredged periodically, with the removed sludges deposited in the active landfill trenches. It is this periodic dredging that TECO alleges to have caused a breach in the liner of pond 2 in 1975, and resulted in the ground-water contamination and cause for corrective action.

The initial steps in the corrective action were to drain the contents of pond 2 into ponds 1 and pond 4, and to cease receiving new wastes into ponds 1, 3, and 4. The old clay liner of pond 2 was excavated and a new liner installed, with the sole purpose to be a retention basin for recovered ground water and rain water. The excavation from these ponds was placed in trenches 23/24. The ponds were backfilled with sandy soil, then capped with three feet of clay.

Pond 2 was the last of the original ponds to be completely closed. As a result of the TWC Compliance Agreement all recovered ground water and contaminated surface runoff that had been stored there was piped to pond 26. It was then excavated to twenty-five feet (like ponds 3 and

4). Excavated material was removed to an active trench, then the area was backfilled and capped with 3-feet of clay. Once ponds 2, 3, and 4 were closed the area was denoted at trench 19. No further wastes were placed in this area.

New Pond 3 was constructed and designed as part of the compliance agreement with TWC. According to item two of the agreement, "only recovered ground water that in the opinion of TECO presents no potential for causing odors or that has been treated by activated carbon absorption may be stored or disposed of in pond 3".

The pond was built in 1980 with a clay liner with underdrain and used until 1983. Even though it was not active after 1983 the pond was kept open as an overflow pond for the treatment system. During this period of inactivity the liquids evaporated and cracks appeared in its clay liner. Therefore in early 1985 the liner was judged inadequate; a new clay liner was installed, with the original liner removed and placed in trenches 35 and 36 during June 1985. Current plans for the pond are to convert it to trench 21 and use it for waste disposal following the closure of trench 37. Presently, this trench does not meet minimum technology requirements for the liner and will need to be retrofitted prior to activation.

Pond 26 was developed as part of the Compliance Agreement between the Texas Water Commission (TWC) and the facility. According to the agreement TECO was to "... construct pond 26 and pond 3 in accordance with the plans and specification submitted to TDWR on January 20, 1981. Pond 26 shall be completed by April 15, 1981. Subsequent to the completion of pond 26, TECO shall transfer water from existing water impoundment ponds 2, 3, and 30 into pond 26."

Construction of the pond began in early 1981 and was completed in November 1981. During the initial liner integrity test a leak was detected and the pond taken out of service. All liquids were removed until the leak was repaired, whereupon the pond was placed back in full service in

Jan-Feb 1982. This was roughly nine months past the original completion date set in the compliance agreement. Reasons for the delay varied from 1) inclement weather, 2) poor quality of off-site clays being used in construction, to 3) difficulties involving the synthetic liner to be used.

Pond 26 was originally intended to be used as a trench and had been excavated to approximately 25 ft. In order to be used as a pond the bottom was backfilled with a clay soil and compacted to 90% standard proctor density. Two feet of compacted clay was placed above the fill at 11.5 feet above the ground-water table. This clay is compacted to 95% standard proctor density and forms the base of the leachate detection system. Four-inch diameter perforated ABS pipe laterals wrapped with filter fabric, and placed in one foot of sand are connected to a single pipe leading to a sump and a riser. This design serves the dual purpose of detection and removal of any liquids which penetrates the overlying liners.

The primary clay liner (or secondary clay containment system) is approximately three and a half (3.5) feet of clay soil compacted to at least 95% standard proctor density. The clay-floor liner is graded to one corner (SW) for drainage. Side-clay liners are thicker than 3.5 feet due to excavation techniques. The sides have an average height of 12 feet with 2:1 side slopes.

Overlying the clay liner is a 60 mil high density polyethylene (HDPE) synthetic membrane. The membrane (or primary containment system) is designed to withstand operational stress and the affects of ultra violet radiation from the sun. The synthetic liner covers the floor and sides of the pond, and is anchored into a trench on the crest of the outer clay dike.

The compacted clay outer dike is approximately 3.5 feet high, is 5-foot wide at crest and has 2:1 side slopes. Current usage of pond 26

is as an evaporation pond for recovered ground water, and contaminated storm water. Natural evaporation is enhanced by the use of a spray evaporation system. This spray system consists of nozzles and trickle pipes supplied by a pump.

Post-November 8,1985 Units:

Trench 36 was the first trench to be completed and activated after the enactment of the Hazardous and Solid Waste Ammendments of 1984 (HSWA). Table 5 is a comparative evaluation of the Minimum Technology Requirements (MTR) as set forth under HSWA and TECO trench 36 (also known as cell 36). It is evident from the table that the major difference is that Trench #36 does not have a sidewall leachate collection system and therefore does not meet MTR. TWC inspected TECO in April 1985 and observed the construction of Trench #36. The lowermost liner was being prepared for installation during this inspection. Hazardous waste disposal commenced on June 8,1985, one month after the May 8,1985 deadline for requiring a facility to meet MTR for any new land disposal unit. Therefore, trench 36 is in violation of Section 3004(0)(1)(A) and Section 3015 (b) of RCRA.

This issue is currently under negotiation between EPA Region VI Regional Council and TECO.

Trench 37 was under construction during the Task Force inspection, at which time the basal compacted clay liner was being installed. Construction specifications for this new trench were reviewed and were evaluated to meet MTR for land disposal trench design. Full construction diagrams and descriptions are included in the Part B Permit Aplication, Volume IV (B), Engineering and Construction Manual.

Table 5

Comparative Evaluation of the Minimum Technology Requirements (MTR) and TECO Trench #36

Statutory Interpretation	Trench 36 Design
Bottom Liner System	
The bottom liner must consist of 36 inches of recompacted soil with a permeability no greater than 1×10^{-7} cm/sec.	Cell 36 contains a composite liner system. The bottom liner consists of 36 inches recompacted soil with a perme ability of 1×10^{-7} cm/sec or-less. This is overlain with a Flexible Membrane Liner with a thickness of 80 mils.
Unit sidewalls should not exceed a maximum slope of 3.1	Cell 36 sidewalls are nearly vertical.
The bottom liner must underlay the entire unit.	The composite liner system underlays the entire unit dimensions, including the sidewalls.
Secondary Leachate Collection/Detection System	
Must consist of 30 cm (12 ") of poorly sorted drainage material with a hydraulic conductivity of 1×10^{-2} cm/sec. This system must contain perforated pipe, compatible with the waste leachate, with a	Cell 36 contains a lower drainage member consisting of 12" of poorly sorted sand with a hydraulic conductivity of 1×10^{-3} cm/sec. 4-inch perforated drainage pipes are located with this sand

Table 5 (continued)

diameter and spacing sufficent enough to rapidly transmit liquids. A slope of 2% is required to promote a gradient sufficent enough to remove liquids.	member at 25 ft spacing intervals. The 4-in pipes are centered between 2% slopes and are sloping at 0.5% into a 12-inch reservior pipe.
Similar to the bottom liner, this system must be located completely up the sidewalls of the unit.	This secondary drainage system does not extend up the unit sidewalls.
This unit must have an associated sump pump which will adequately remove all liquids.	The reservior pipe slopes at 0.5% into a 10 inch primary riser and is connected to a 2 ft sand sump.
<u>Primary Liner System</u>	
The upper FML should be located above the secondary drainage system and cover the entire the unit including sidewalls. This liner must be waste compatible and, at a minimum, 30 mils thick. However, if exposed for extended periods of time to the atmosphere, the liner must be at least 45 mils.	Cell 36 design includes a upper FML of 80 mils in thickness and an associated 1 foot clay liner. The clay liner is located between the FML and the lower leachate collection system. Neither the FML or clay liner extend up the unit sidewalls. No filter material is utilized below the clay liner. Possible clogging of the lower leachate collection system by fines may take place. The clay unit will also retard the time it takes to detect leaks in the upper FML.

Table 5 (continued)

Primary Leachate Collection/Detection System

As with the secondary leachate Collection/ Dectection System, this system must consist of 1 foot of coarse grained drainage material with a permeability of 1 x 10^{-2}cm/sec.	Cell 36 utilizes 12 in. of sand as drainage material with a permeability of 1 x 10^{-2}cm/sec.
The recommended drainage pipe should consist of 6 inch diameter pipe which is chemically resistant to leachate. The recommended separation distance is 50 to 100 feet between pipes with an associated 2% slope. Other diameter pipes at different spacing intervals can be used, if it is shown, by mathematical calculations, that the hydraulic head of collected leachate will not exceed 1 foot.	Located within this drainage membe are 4-in. ABS perforated drainage pipes with a separation distance of 25-feet. The slopes between pipes are 2% and are themselves sloping 0.5% into a 12-in. ABS reservior pipe. Cell 36 utilizes a geo-textile filter fabric between the pipes and drainage materials which may affect the system performance.
An associated filter media above this drainage member should be utilized to prevent clogging of the system by fines	The unit design does not include an overlying filter media to preve clogging of the drainage system by fines.
	The drainage member does not extend up the unit sidewalls.

Facility Operations

Waste Characterization:

TECO requires that all waste generators utilizing its facility supply a physical and chemical analysis of a representative sample of each waste stream before authorizing disposal The corporate office provides a new computer printout of all technical, analytical, administrative, and previous disposal information when scheduling a waste shipments to the facility. The printout is reviewed on the corporate level with no shipment being accepted without the approval of the corporate technical review committee.

Facility-generated wastes such as motor oil, rags, shop wastes,etc. require no special analyses and are disposed on site. Large volumes of special wastes such as surface impoundment liquid or leachate do require analysis to determine proper handling and disposal methods. Because, as of May 1985, TECO no longer accepted or disposed of bulk liquids at their facility, facility generated bulk liquids are transported to an approved disposal site. Currently they are using the Chemical Waste Management, Corpus Christi, Texas, injection well.

Whenever a waste shipment arrives at the facility the waste material is inspected by the Chemical Safety officer, assistant facility manager or laboratory technician. The procedures for waste acceptance as observed during the inspection are:

1) Driver registers at gate and is issued a visitor's badge, hard hat and 1/2 face respirator.

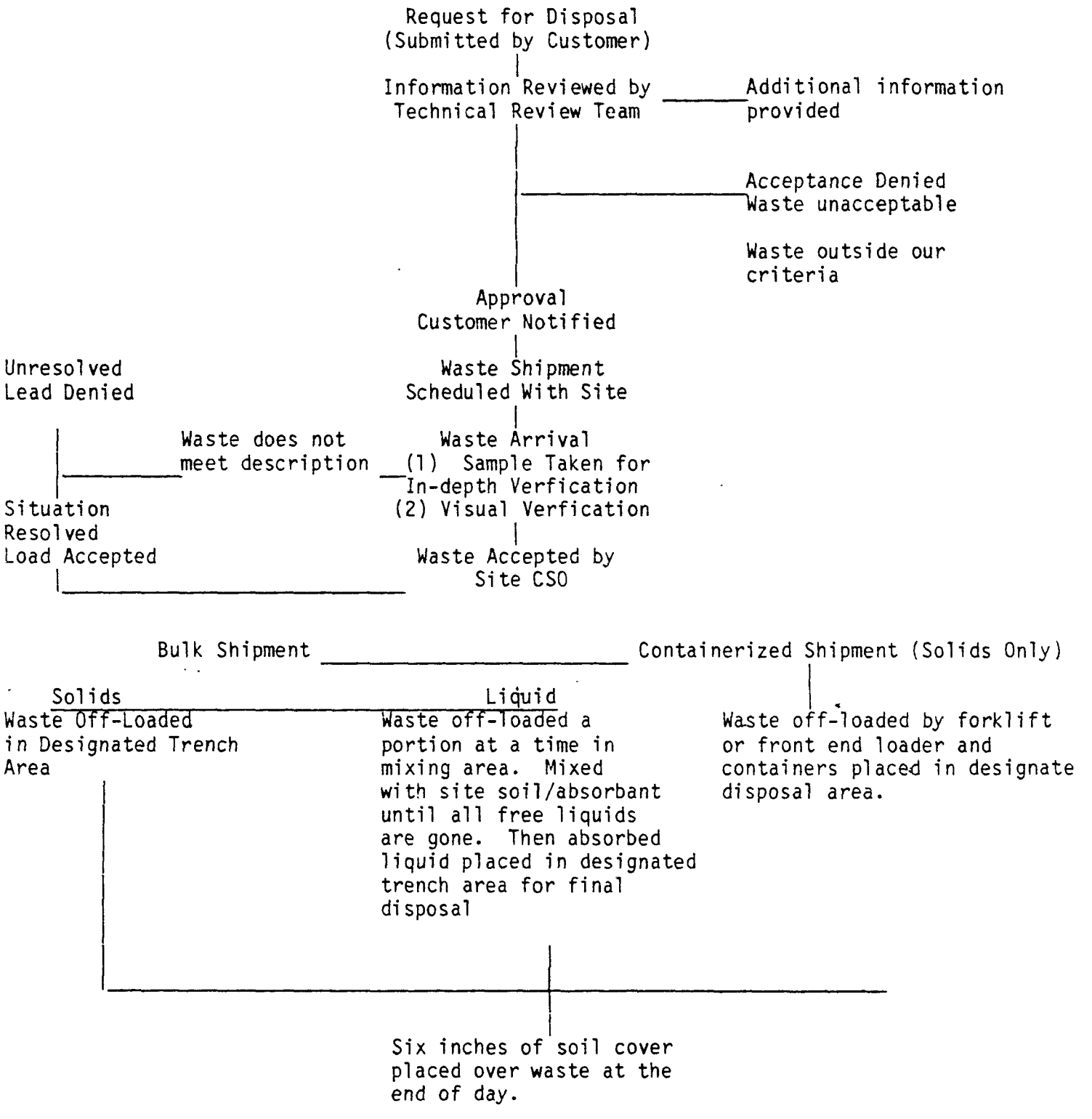


Figure 4 - Schematic of waste acceptance procedure

2) Accompanying manifests are given to TECO representative and checked against computer printout for corporate approval, technical and analytical information, EPA waste code, Texas waste number and expiration date.
3) Any discrepancies are noted and the corporate office notified. Random sampling of 10% of the waste is performed to verify contents. If shipment consists of drummed wastes, all drums are opened to verify solidification, but only 10% are sampled.
   a) Two man teams sample waste wearing tyvecks®, respirator, hardhat, face shield and nitrile gloves.
   b) A random composite sample is tested for pH, density, water reactivity, and a paint filter test for sludge.
   c) If one anomalous drum is found then all drums are tested individually.
   d) A density test is performed for bulk loads.
   e) Laboratory technician completes lab analysis form.
4) A Work Order Log Book is maintained and includes work order number, customer name, date work order is completed, and date verification, analysis is received. When applicable waste samples are shipped via UPS to corporate lab in Louisville, KT for detailed verfication of waste content. The work order provides TECO personnel with a check-off and data recording form for all waste shipments received.
5) Volume of waste is verified against manifest. If a volume discrepancy of more than 10% is discovered it is noted on the work order and the corporate office notified.
6) When the waste has been accepted the waste stream number, waste category, trench number, trench cell, disposal date, manifest number, quantity, and disposal location is to be recorded on the work order form.

Figure 4 is a schematic flow chart of the waste acceptance procedure.

Waste Compatibility:

All wastes are segregated within the trenches based on compatibilities. The three cell system described in the section on Waste Management Units is designed to ensure that incompatible materials do not come into contact.

The following wastes are not accepted.

- Liquids with boiling point above or equal to 100°F.
- Pyrophorics
- Cyanide or Sulfide compounds with 10% CN^- or 5% S^-(except in lab packs)
- Etiologic Agents
- Explosives
- Gas Cylinders
- PCB materials as defined by TSCA (c/o CFR 261)
- Peroxides (organic)
- Radioactive materials
- RCRA reactive materials
- Liquids with pH > 12.5 or < 2.0
- Solids with a 1% solution pH > 12.5 or < 2.0
- Containerized liquids (except in lab packs).
- Absorbed liquids in bulk.

Disposal Operations:

The Chemical Safety Officer designates waste disposal areas within the appropriate trenches. No wastes are to be placed in direct contact with the synthetic membrane liners, and clean soil is to placed where needed to prevent potential reactions.

Drums are disposed in an upright position in the trench cell. Each container (except for lab packs) is punctured to create 2-one-inch holes near the bottom and 2-one-inch holes along the side midway. No drums are placed closer than one foot to the synthetic membrane liner.

Whenever bulk solid wastes are being disposed the transport vehicle is taken to the trench and unloaded there. Supposedly only materials that can be unloaded without dust or producing odors beyond the active trench area are accepted. During the inspection it was observed that certain waste loads did omit odors beyond the trench. When these odors were discovered. the Chemical Safety Officer ordered the trench operators to place more cover on the waste for odor control. Historically, state and local agencies have received numerous complaints by local residents concerning odor problems. A minimum of six inches of cover is placed following waste disposal. Similar to drummed wastes, bulk solids are not to be placed within one foot of the synthetic liner wall.

No absorbed bulk or containerized liquids waste have been accepted since May 1985. Generators of liquid wastes must provide proof that the liquids have been solidified and are maintained in their least solute and/or toxic form.

Bulk or containerized wastes will sometimes arrive on site containing free liquids. These liquids are stabilized/solidified using kiln dust, fly ash, portland cement or lime.

Bulk solids and solidified liquid ignitable wastes are placed into a container prior to disposal in a landfill trench. The type of container used was not specified.

Liquid/sludge waste when generated from the ground-water treatment plant will be disposed on site. The initial volume of accumulated sludge from the system will be stabilized with portland cement in a cement mixer. Future volumes will be dewatered using a filter press prior to disposal. Both techniques were still under study by TWC at the time of the inspection.

Waste Location:

TECO maintains records of a system of cells, with coordinates within a ten-foot tolerance, within trenches surveyed within a one foot tolerance, and the contents of each cell. Past experiences where TWC requested that unacceptable drummed waste be removed has found this system to be adequate.

Sump/Leachate Monitoring:

An adequate leachate detection system at a facility such as TECO is important because contaminants detected here are the precursors of contaminants to be found in the ground water if not handled promptly and correctly.

Leachate is measured and withdrawn daily from all trench sumps. The leachate is collected in a portable tank, then transferred to a vacuum truck. The leachate is handled as a hazardous waste and is manifested to a bulk liquid hazardous waste disposal facility.

Septic System:

A question arose during the inspection regarding the septic system at TECO because several of their ground-water reports stated that sewage wastes are disposed in the upper aquifer. Both the facility manager and Nueces County Health Department were questioned on this issue. It was established that in special cases where low permeability clays are present and a horizontal lateral field proves ineffective, permission for an alternate vertical absorption bed is granted by the Texas State and County Health Departments.

This permission was granted by the demonstration that the sand underlying the surficial clay was either dry or below a certain dryness point before a county health inspector. This was apparently accomplished and then vertical absorption beds were installed. The exact depth of these lines is unknown but is believed to be between 33 to 40 ft. depending on space and soil conditions. No vertical system is permitted within 300 ft. of a water well.

The TECO vertical septic system drain field should be classified as an industrial drain well of the UIC Class V well scheme.

Inspections:

TECO maintains several inspection log records for various aspects of the facility. Depending on the topic these logs are maintained on a daily, weekly, or monthly basis. Several of the records were reviewed during the Task Force inspection. It was found that up-to-date entries were not always present and time gaps between entries existed.

An example of a time gap was seen in the Tank Farm Inspection Record. This inspection log was begun April 1, 1985, however there were no entries for the 80,000 gallon recovered water storage tank until January 10,1986 when a leak was detected. This type of gap in the inspection log could either indicate that the seals and tank was not inspected until that time or no notations were made until a leak was detected. Further, there were no subsequent comments regarding the repair of the tank. The following inspection on January 13,1986 recorded the tank freeboard but did not mention the leak or any repairs.

There were other leaks noted for the Clarifier and Fast unit tanks within the Water Treatment System on November 8,1985 and December 3,1985. No subsequent entries mentioned further leakage or corrective action for the leaks initially found.

Future Operations:

The TECO facility accepts about 657,000 cubic feet of wastes per year with plans on increasing this to 1,210,000 cubic feet per year. An estimated ~4,500,000 cubic feet capacity remains. Current land use rate is estimated to be 25% to 33% waste with 75% to 67% backfill. Using these figures, they have a future waste handling capacity of 31,185,000 cubic feet and an expected life span at the facility of 25 years.

Attachment C illustrates current and proposed cell locations. Following the completion of Trench 36 TECO plans to begin using new Trench 37 and/or Pond 3 which is to be converted to Trench 21. Future expansion plans call for the construction of 15 new trenches.

The expansion plan also shows future disposal in the recovery well area. This would indicate that once the contamination plume is fully recovered and background quality is established, disposal trenches will be constructed there.

SITE HYDROGEOLOGY

Several investigations have been conducted by Texas Ecologists, Inc. consultants to define the hydrogeologic setting of the Robstown facility. The various reports were presented during the Task Force inspection and reviewed.

Local Physiography:

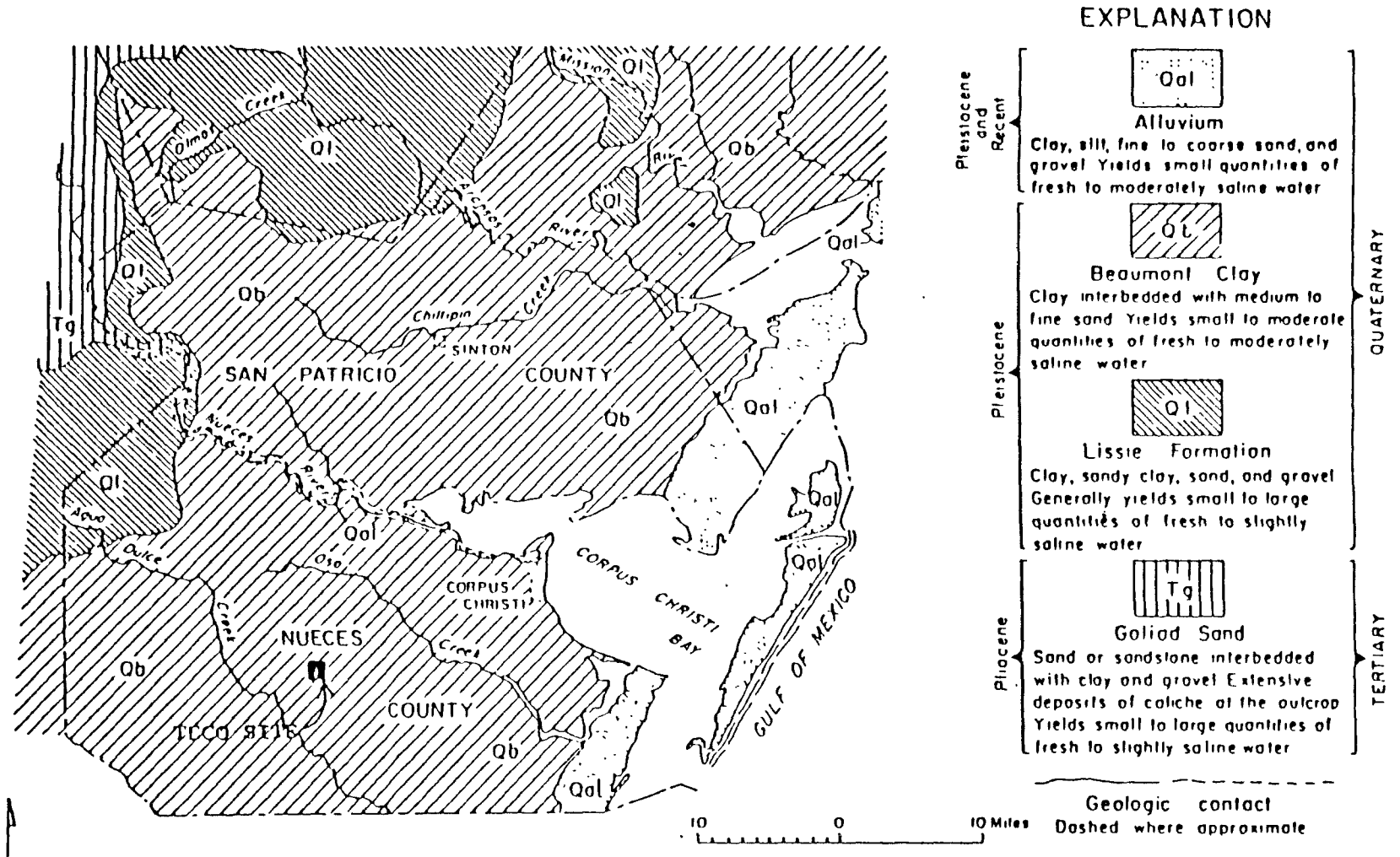
The site is located in the Gulf Coastal Plain physiographic province, (Figure 5). The area is characterized by low relief with an average site elevation of 65 feet above mean sea level (MSL). Regional slope is toward the southeast at about three feet per mile. Original topography of the site followed the regional trend, however, this has been modified by the construction of landfills, dikes, capping of landfill cells, and stockpiling of soils.

Regional drainage is generally perpendicular to the coast. Stormwater runoff drains to a north-south trending county-maintained drainage ditch, which bisects the site, thence to Petronila Creek about 7.5 miles to the south and eventually to Buffin Bay. *

The facility is constructed on Victoria Series Soils. This soil series consists of dark gray to nearly black, moderately crumbly, calcareous clay and sandy clay. The soil is characterized by its very high shrink-swell capacity. Surface soils will dry and form desiccation cracks nearly every summer, however, the subsoil can absorb and store much water in a short period of time during heavy rains in the fall.

---

* It should be noted that rainfall flowing to active trench areas is collected and placed in pond 26. Runoff from non-contaminated areas is directed towards the county drainage ditch. Local residents near the TECO facility have complained to authorities that contaminated water is being diverted to this ditch. No evidence of this fact was found during the inspection. TWC is evaluating the need for a stormwater discharge.



Geology of Nueces and San Patricio Counties and Adjacent Areas

Figure 5 Site Area Geologic Map

From: Texas Water Development Board Report 73, "Groundwater Resources of Nueces and San Patricio Counties, Texas", 1968.

County drainage ditches were developed in the area to assist in the removal of excess water from the clay soils. Local residents supplied descriptive information to the Task Force on the degree of cracking that occurs in the shallow soils. It was reported that they had observed during their long time farming and living experience in the area that the soil cracks can be several hundred feet long and tens of feet in depth.

Soil permeability* ranges from 0.10 to 0.20-inches per hour at the surface to 0.01 to 0.05 inches per hour at five feet in depth. Natural soil pH is 8.0 to 8.9. The soils have a poor suitability rating for septic tank disposal systems due to their low permeability and high shrink-swell potential. A chemical and physical analysis of the soils shows that 52 to 59 percent of the soil is made up of clay less than 0.002 mm. The nitrogen and carbon-nitrogen ratios decrease with depth, but the estimated salt content, electrical conductivity, and calcium carbonate equivalents increase with depth.

Local Geology:

The TECO site is underlain by Pleistocene fluvial deltaic sediments which are divisible into two mappable units of the Beaumont Formation:

1) Distributary and fluvial sands and silts with levee and crevasse splay deposits; and
2) Interdistributary mud, including bay, flood basin and abandoned channel facies.

---

* Soil permeabilities based on values from the Soil Conservation Service and represent the rate water moves through a specific soil horizon.

The distributary channel deposits form an elongate branching pattern oriented in an east-southeast trend towards the coast. Regionally, these deposits are mapped as the Beaumont Formation which consists mostly of clay, silt, sand, and gravel with concretions and massive accumulations of caliche** ($CaCO_3$) and concretions of iron oxides and iron-manganese-oxides in zones of weathering. The thickness of the formation is approximately 100 feet.

The Lissie and Goliad Sand Formations underlie the Beaumont, with the Lissie Formation at around 460 feet and the Goliad below. These two formations are not exposed in the site vicinity, but do outcrop roughly 20 miles northeast of the site. Due to the similarities of all three formations in their environments of deposition and lithology, distinction between them is difficult.

A generalized stratigraphy underlying the site consists of the following horizons:

Horizon	Description	Thickness	Permeabilities
Surficial Clay	Tan and gray clay to sandy clay, with sand lenses and caliche.	15 feet	10^{-7} cm/s
First Sand	Tan silty sand with clay lenses. Variable fines content yields clayey to silty to clean sands	10 to 40 feet	3.6×10^{-3} to 3.3×10^{-5} cm/s
Second Clay	Tan, gray, and brown clay, sandy clay, and clayey sand with sand lenses to 15 ft. thick; caliche; slickensides *	15 to 35 feet	
Second Sand	Tan sand with clay layers; Few borings penetrate this zone; Fully saturated	25 to 53 feet	

** Caliche is sediment which has been cemented by porous calcium carbonate.

* Slickensides - pedological features that are produced by dessication and differential movement.

Cross sections prepared by TECO consultants lack adequate well control to give any great detail. Cross-section interpretations prepared by TWC have more well control. Both TECO and TWC cross sections are shown in Attachment C. They show that sand lenses in the Second Clay are sizable and that the Second Clay thins to as little as five feet above and below a thick (12 foot) sand lens in the east-west cross section. The north-south cross section reveals complicated sand body geometry which is suggestive of a channel deposit. This feature, and a similarily shaped clay deposit in the east-west section, if continuous, would define a structure with a northeast trend within the first sand, and delineate a preferential path for ground-water flow.

Local Hydrogeology:

The major aquifer for ground-water development is the Gulf Coast Aquifer which yields potable water from a depth of about 350 feet. This aquifer is used by adjacent landowners for both drinking and irrigation, and by TECO for production and irrigation.

Ground water occurs beneath the facility at a depth of about 30-feet below the land surface. The first water-bearing sand unit contains water of variable salinity in a saturated interval of 15 feet, (referred to as the First Sand). The Second Clay horizon from about 10 to 25 feet thick separates the first sand unit from the second water bearing sand unit. Teco monitors these two shallow saturated sands beneath the site. Contamination of the First Sand has been attributed to previous site disposal practices and is discussed later in the report. Studies have been conducted to define the extent of contamination, which appears to be confined to the First Sand.

Ground water is encountered under unconfined or water-table conditions in the First Sand which is primary the monitored zone. Recharge occurs through surface infiltration at areas where the overlying Surficial Clay is thinner than the normally observed 15-feet. Three recharge zones have been identified at the site. The first is in the southeast corner of the

TECO property where the clay thins to 12 to 18 feet. The second is along the western side of the property where a thinning clay structure extends towards the center of the site. Finally, the third area is a man-made recharge mound resulting from the county drainage ditch which runs north-south across the site, and produces a radial pattern of flow away from the ditch.

Through various tests performed by Texas Ecologists and their consultants, calculated permeabilities have been determined to range between 3.8×10^{-4} cm/sec to 1.2×10^{-5} cm/sec. Velocities for this same horizon (First Sand) were shown to range between 1.6×10^{-1} ft./yr. to 7.2×10^{-2} ft./yr.

Water level data for the First Sand are plotted and contoured monthly for the TECO monthly Ground-Water Compliance Agreement Report which is sent to TWC. Attachement E contains copies of reports for February 1986 and February 1982

Due to recharge areas on site a "saddle" occurs near the covered mixing basin at the center of the site. Flow, therefore is split into both northerly and southerly directions. Ground-water gradients (based on a 1985 TWC report) range from 0.0059 ft./ft. in the southeast corner of the site to nearly flat in the "saddle". A cone of depression is being formed by the pumpage of recovery wells and the recovery trench drain. A series of recharge wells in the northeast corner may be creating a slight ground-water mound and further impeding the natural flow to the north-northeast. The steepest gradient on site, 0.0322 ft./ft., is associated with the recharge mound and recovery cone.

Vertical downward gradients are implied from the unconfined First Sand to the semi-confined Second Sand by water level differences. For example at monitoring well E-35 (completed in Second Sand) a difference of at least one foot was observed, and at well E-38 (completed in Second Sand) a difference of 5.82 feet was observed.

Equilibrium is closest at E-41 where the difference is about 1.1 foot. This area also contains a sand lens within the confining layer of clay that may be a potential contaminant pathway for vertical migration. The Part B Permit Application for TECO contends that these two sands are not connected, based on extended pumping at monitoring well E-40 and water level observations in adjacent deep wells and shallow wells. No supporting data was presented to verify this fact. Ground-water flow rates in the First Sand were calculated by TWC to range from 0.5 ft./yr. to 18.9 ft./yr outside the area of pumpage, and 85.5 ft./yr. at the steepest side of the cone of depression. This contrasts very sharply with natural flow rates and the rates calculated by TECO.

GROUND-WATER MONITORING PROGRAM

The following is an evaluation of the monitoring program and how it has evolved over the years until the time of the Task Force inspection. This section discusses the following topics:

- Regulatory requirements
- Monitoring Wells (construction and placement)
- Development of the Compliance Agreement and Corrective Action Program
- Special studies pertaining to ground water and waste units

Regulatory Requirements:

State regulations for interim status facilities are contained in Title 31 of the TAC Section 335, subchapter E through T, which became effective on November 19,1980. The State ground-water monitoring requirements (Subchapter I) are nearly identical to RCRA interim status requirements contained in Title 40 of the Code of Federal Regulations Part 265 (40 CFR Part 265), Subpart F; there are no substantial differences. Equivalent regulations are shown in Table 5.

As a result of a contamination plume being discovered at TECO prior to November 1980 TECO petitioned for and has followed an Alternate Ground-Water Monitoring Program rather than the standard Interim Status Monitoring Program as set forth under 40 CFR Part 265 Subpart F. The current monitoring network, sampling parameters, frequency, and reporting guidlines are specified in the February 1981 Compliance Agreement, (Attachment B).

Pre-Compliance Agreement Monitoring:

Prior to November 1980, when RCRA came into effect, and February 1981, when the currrent compliance agreement was initiated, Texas Ecologists operated

TABLE 5

Interim Status Regulations -
Corresponding State and Federal

Subpart Title *	TAC (Title 31)	RCRA Regulation (40 CFR Part)
Applicability	335.191	265.90
Ground-Water Monitoring System	335.192	265.91
Sampling and Analysis	335.193	265.92
Preparation, Evaluation and Response	335.194	265.93
Reporting and Recordkeeping	335.195	265.94

* Subpart titles are the same in both the State and RCRA regulations.
** TAC regulation number as of February 1986.

under the July 1972 Certificate of Registration for an Industrial Solid Waste Management Site. The permit application was submitted January 1972 and contained the logs of two soil borings drilled to a depth of 40 feet below ground level. The borings indicated a surficial clay layer approximately 15 feet thick underlain by approximately 15 to 20 feet of tan silty, clayey sand. The early permit did not contain any ground-water monitoring or site characterization requirements, so no further site studies were conducted at this time.

As the site expanded, three additional borings were made in November 1974 to confirm the initial two borings. While drilling these borings ground water was encountered at 39 feet below ground surface. Once again, no monitoring wells were constructed from these borings because of a lack of specific permit requirements.

When the facility again found the need to expand in 1977, four exploratory soil borings were made to the west of the then active trenches and surface impoundments. Trinity Testing Laboratories, Inc. conducted the study which reported a general description of 4.0 feet of dark gray fatty clay; 6.5 to 10.5 feet of tan fatty clay; overlying tan clayey fine sand. Coefficients of permeability for the fine sands underlying the clays could exceed 1×10^{-7} cm/sec. Ground water was encountered at three of the four borings at a depth of 39.0 feet. No monitoring wells were constructed from these borings. Soil tests from these 4 borings showed subsurface contamination had occured, and the results were reported to TWC.

Based on the contamination found, between 1977 and 1980, seventy-six wells and borings were made, during 11 seperate episodes at the facility, in a progressive manner as based on data retrieved from each previous drilling episode. Each episode (performed at the request of TWC) of drilling was aimed at further defining the plume of contamination and the its source. Even though not performed under any enforceable order, well installation and subsequent studies were designed at developing a corrective action for the contamination plume.

TWC instructed TECO to install five ground-water monitoring wells around the active portion of the site after being notified of the subsurface contamination found in the soil borings. This initial set of wells, called the D series, were dry and were soon replaced with five new wells during November 1977. Ground-water monitoring wells W-1 through W-5 were installed in the northeast section of the facility, north of the then active surface impoundments, ponds #1 through 4.

These wells were constructed with 4 inch PVC pipe. Type of coupling used was not recorded on the well construction logs, therefore they could have been threaded or glued. A PVC cap was shown to be in place at the base and top of the well. Five feet of screen is at the bottom of the well,(screen size is also unknown). A coarse grade filter sand was used as a packing from the base of the screen to the upper clay, ranging from 29 to 35 feet. Overlying the sand pack was a two-foot clay seal, followed by 11 to 13 feet of concrete grout. A 4'x4'x6" concrete apron was poured around the well surface. Initial testing of these first four wells found high concentrations of TOC in wells W-3 and W-4, as compared to background values for the area.

As a result of the elevated TOC found in the wells W-3 and W-4, TWC requested further study of the contamination, which included further soil borings, monitoring wells and confirmatory sampling. During the period between December 1977 and June 1978, TECO conducted an additional ten soil borings and installed nine new monitoring wells north of the surface impoundments. Samples from all of these borings except three had an amber color and an "organic" odor. Monitoring wells B-1, B-2, and B-3 were installed in February 1978. Wells B-1 and B-2 were reported to be dry and well B-3 showed no contamination. The lithologic logs for these wells were not available, only a very general construction diagram was provided. Confirmatory sampling was conducted in February 1978 and again in June 1978. Elevated levels of TOC were once again found in wells W-3 and W-4, with W-4 having a high of 8,330 ppm. This initial study of the contamination indentified surface impoundment pond #2 as the most likely source of contamination.

Some of the borings were coverted to wells in April - May 1978 (i.e., W-6, W-7, and W-10 through W-13). These wells were placed to monitor the ground water west of the impoundments and upgradient of any active trenches.

The wells are constructed in a similar manner as the earlier W series wells, using 4-inch PVC casing with 5-feet of slotted screen at the base. The major difference is the coarse-grade filter sand extends past the in-situ sand into the upper clays, whereas the earlier W series wells indicated a clay seal was placed at the contact. A situation like this will allow soil particles to easily migrate through the sand packing and cause siltation in the well, in contradition to 40 CFR 265.91 (c).

Following the installation of these new wells and the confirmatory sampling it was decided by TWC that a ground-water recovery program should be initiated. A pump was installed in well W-4 in June 1978. Prior to this point all monitoring well activity had been aimed at characterizing the contamination plume. Following the initiation of pumping TOC decreased from 8,000 ppm to 6000 ppm.

Wells W-4A, W-4B, and W-4C were installed in August 1978, north of W-4. No lithologic logs or well-specific construction diagrams were available, only a general well construction diagram was presented. All three of these wells are in the contamination plume.

During April 1979 seventeen exploratory borings were made in the area north of the ponds to determine the northern boundary of the contamination plume and to characterize the northern lithologies. No monitoring wells were constructed as a result of these borings.

Based on the findings of the seventeen exploratory borings, the X and P series monitoring wells were installed. Wells X-1 through X-4, P -1 through P6, and P-8 through P-15 were installed May 1979. Well P-7 was completed July 1979. No lithologic logs were presented for these wells and the well completion diagrams that were submitted are very general and do not provide good detail.

The wells were apparently constructed using 4-inch PVC pipe with the screen covering the entire thickness of the First Sand. Neither the type of packing used around the screen nor the screen size was specified. Above the screen are two "packers" of unspecified type. These packers were apparently placed at the sand/clay contact. Immediately above the packers the well was grouted with bentonite pellets. The type of grouting used above the pellets is also not specified. Notes from the Task Force field inspection do indicate a 4'x4'x6" apron around most of these wells.

The lateral extent of the contamination plume had been fairly well established by August 1979, and it was decided by TWC that a more extensive ground-water recovery system was needed. Pumps were installed at wells X-1 and X-3, within the plume boundary, in addition to well W-4. During November-December 1979 wells P-7A, P-11A, P-12A, X-1A, X-5, and X-6 were installed. The construction diagrams shows 4-inch PVC casings were installed with 15 feet of 8 gauge well screen. The screen was set at the base of the first sand/second clay contact. Filter sand (-40 + 60 screen) was used as a packing around the screen plus 2 feet above. The sand packing was followed with bentonite pellets then concrete grout to the surface. The lithologic logs have very general descriptions but do indicate the same clay-sand-clay sequence as was detected in earlier wells. Correspondence from the drilling company indicates that drilling fluid was used to advance these holes, which could have affected early well recharge and analytical results, if not developed adequately prior to sampling. This could have also chemically biased early sampling results.

Soon after their installation, wells X-1A and X-6 were also placed on line as part of the recovery system to improve ground-water recovery.

Well W-17 was constructed April 1980, in an attempt to delineate the southern extent of the contamination plume. Lithologic logs were available, but no construction log for the well could be found.

Monitoring well X-2A was installed June 1980 adjacent to X-2. Being constructed approximately 6 feet deeper,its base is set in clay rather than silty sand as with X-2.

The E-series wells (E-1 through E-11) were installed in October 1980. Wells E-2 through E-10 were positioned across the north end of the site between the known contaminated wells (W-4 series) and the ponds. E-11 was placed at Pond #2 northeast corner and E-1 was placed approximately 150 feet north of the line of wells (E-2 through 10).

Each well was constructed of 4-inch O.D. schedule 80, threaded, PVC pipe and 15 feet of 4-inch O.D. schedule 80, threaded PVC, pipe with 0.015-inch slotted openings as the screen. Clemtex No. 2 sand was used to pack the well from the bottom to the base of the first clay. The remainder of the well was grouted with bentonite pellets (one foot) then cemented. Odors and the appearance of water were noted on the logs. There is no evidence that a comparative grain size analysis was conducted between the native soils, sand pack, and screen slots.

Wells OB-2 and OB-3 were installed in December 1980. These two wells were slightly deeper than the earlier wells and are located along the northern property boundary. The same construction materials were used for this well as for the early E series wells. The major difference is that the screen and sand packing extends the entire length of the first sand (approximately 45 ft).

Compliance Agreement Monitoring:

A Compliance Agreement was issued to TECO for review, in December 1980. This was revised, and a new Compliance Agreement was issued on February 9, 1981 and signed by TECO on February 26, 1981. (Attachment B) The Agreement addressed the following four items:

1) An accelerated ground-water recovery program.
2) Specifications for new pond construction and facility certification.
3) "Deep Zone" ground-water monitoring.

4) Additional subsurface investigations in the area of trenches 1-14. *

Between April and June 1981, thirty ground-water monitoring wells were installed. Twenty-three were shallow (50.6-feet depth average) and seven were deep (100-feet each).

The shallow monitoring wells constructed at this time were wells E-12 through E-34. Seventeen of these wells were equipped with recovery pumps and added to the system as directed in the Compliance Agreement. The lithologic logs and construction diagrams are very generalized and do not indicate specific construction details. No construction diagrams are available for the deep wells. **

Contamination was detected in monitoring well W-17,in 1981. W-17 was thought to be south and outside of the contamination plume, therefore, when contamination appeared in ground-water data an assessment of the cause was ordered by TWC, May 1982. This assessment was in addition to the regular monitoring and subsurface investigations outlined in the February 81 Complaince Agreement. Monitoring wells W-18 through W-21 are a result of this assessment, (results of this assessment are discussed further in this chapter).

Wells W-18 through W-21 were installed to monitor the first sand, or upper aquifer, with their base depth being the top of the second clay. The wells were constructed of 4-inch I.D., schedule 40,threaded PVC pipe with a screen of 4-inch I.D., schedule 40 PVC, and .020 inch slotted openings. Fifteen feet of screen with a sand filter pack constitute the bottom portion of the well. The sand filter appears to extend approximately 5 feet above the screen portion. Overlying the the filter sand is one foot of bentonite pellets and above the pellets to the ground surface is a cement-bentonite grout. No specifications were available for the cement bentonite grout.

---

* Construction details of the new pond are discussed earlier under the section on Waste Management Units. This section discusses the item from the agreement or events directly resulting from it pertaining to ground water.

** It should be noted that the history of wells given in the closure plan states these wells were installed August 1981. However, the lithologic logs indicate April-June 1981.

Wells E-44 through E-49 were installed February 1983. The wells have 10 feet of screen, but other than that they are identical in construction to wells W 18-21. These wells were the last to be installed as part of the recovery/ corrective action program as established under the February 1981 Compliance Agreement.

Six exploratory borings were made of the old Mixing Basin or Trench 17/18 area in March 1983. No wells were developed from these borings. These borings were part of the 1982 assessment phase for contamination detected in W-17.

Monitoring well P-16 was installed May 1983. No construction log was available.

The last two borings or wells to be made at the site are wells W-14 and 001. W 14 was installed to replace dry well W-13 and 001 was installed to replace well P-3 which had been destroyed.

Design of the wells encountered at TECO are not in adherance of 40 CFR 265.91 (c)

As of February 1986 the recovery and compliance monitoring system as proposed in the TECO Compliance Plan, consisted of the following network of wells (the below listed designations of wells are not those proposed by TECO for the final permit:

Recovery Wells

E-9	E-18	E-13
W-4	E-17	E-12
E-7	E-1	P-11
E-6A	E-16	E-19
X-1A	X-2A	W-17
X-5	X-3	FD-2
E-20	E-15	

Background well

P-7

Plume Characterization Wells

E-33	FD-2	W-4A

Monitoring Wells (Outside Area of Contamination)		Monitoring Wells (Inside Area of Contamination)	
E-32	E-2	E-34	E-25
E-23	E-24	W-3	W-20
E-22	W-19	X-6	E-4
E-10	W-18	W-4A	W-4B
P-12	W-21	W-4C	E-11
P-13		E-31	

Deep Wells		Compliance Point Wells	
E-39	E-41	E-5	W-5
E-40	E-42	E-2	E-11
E-35	E-36	E-22	
E-37	E-38		

All compliance point, background, deep wells, wells outside, and wells inside the plume are sampled on a monthly basis for pH, chemical oxygen demand, total organic carbon, specific conductivity, water level, odor, and appearance with the exception of the recovery wells. Attachment E is an example of several monthly and yearly reports that were submitted by TECO to TWC. Recovery wells are sampled for these same parameters on a quarterly basis due to the difficulty in removing and replacing the pump systems. A more detailed analysis of the quality of the data is included later in the report.

Table 7

List of Wells and Borings

ID NO.	Date Installed	Surface Elevation	Total Depth	Depth to Screen	Depth to Sand Pack	Depthe to water Encountered	Comments
1	'71			No logs	or Data		Test Boring
2	'71			No logs	or Data		Test Boring
3	11-13-74		40				Test Boring
4	11-13-74		40				Test Boring
5	11-13-74						Test Boring
D-1	77			No logs	or Data		Dry
D-2	77			No logs	or Data		Dry
D-3	77			No logs	or Data		Dry
D-4	77			No logs	or Data		Dry
D-5	77			No logs	or Data		Dry
W-1	11-10-77	65.51	45.5	37.2	13.0	27.34	
W-2	11-10-77	64.61	45.0	38.4	14.0	35.67	
W-3	11-10-77	66.55	50.5	41.1	13.5	32.70	
W-4	11-9-77	68.51	61.0	45.4	15.0	35.89	Recovery Well
W-5	11-11-77	66.11	55.5	48.6	12.51	33.96	Complaince Point
B-1	2-20-78	67.5	40.1	34.9	3.0	39.20	
B-2	2-20-78		40.0				Destroyed
B-3	2-20-78	66.7	40.0	35.4	3.0	38.90	
W-6	4-6-78	64.31	55.0	unknown	8.0	29.98	
W-7	4-6-78	65.01	55.0	unknown	7.0	34.63	
W-10	5-2-78	65.51	47.3	unknown	8.0	35.08	
W-11	5-2-78	64.91	44.9	unknown	8.5	34.36	
W-12	5-5-78	64.91	44.9	unknown	8.0	33.51	
W-4A	8-24-78	67.21	35.0	29.0	unknown	8.0	
W-4B	8-24-78	67.31	35.0	29.0	unknown	8.0	
W-4C	8-24-78	67.21	35.0	29.0	unknown	8.0	
W-13	5-5-78	65.21	55.2	unknown	unknown	34.2	
X-1	5-9-79	67.01	41.0	14.0	15.0		
X-2	5-9-79	67.21	46.0	13.0	14.0		
X-3	5-8-79	67.61	46.0	14.0	15.0		Recovery Well
X-4	5-9-79	67.31	42.0	14.0	15.0		
1	4-13-79		55.0			34.0	Test Boring
2	4-19-79		50.5			37.0	Test Boring
3	4-19-79		50.5			46.0	Test Boring
4	4-19-79		50.5			30.0	Test Boring
5	4-20-79		50.5			35.0	Test Boring
6	4-20-79		35.5				Test Boring
7	4-20-79		50.0			37.0	Test Boring
8	4-23-79		50.0			33.0	Test Boring
9	4-23-79		50.0			35.0	Test Boring
10	4-24-79		50.5				Test Boring
11	4-24-79		35.5				Test Boring
12	4-24-79		50.5				Test Boring
13	4-25-79		45.5			33.0	Test Boring

Table 7 (continued)

ID NO.	Date Installed	Surface Elevation	Total Depth	Depth to Screen	Depth to Sand Pack	Depth to Water Encountered	Comments
14	4-25-79		45.5				
15	4-26-79		45.5			34.0	Test Boring
16	4-26-79		45.5			37.0	Test Boring
17	4-26-79		45.5				Test Boring
P-1	5-9-79	64.61	44.0	18.0	19.0		
P-2	5-21-79	63.21	44.0	12.0	13.0		
P-3	5-21-79	64.11	44.0	13.0	14.0		
P-4	5-21-79	62.91	45.0	12.0	13.0		
P-5	5-21-79	62.91	46.0	12.0	13.0		
P-6	5-2-79	65.81	42.0	12.0	13.0		
P-8	5-2-79	68.81	45.0	14.0	15.0		
P-9	5-2-79	66.91	42.0	14.0	15.0		
P-10	5-2-79	67.21	46.0	14.0	15.0		
P-11	5-8-79	67.21	42.0	15.0	16.0		
P-12	5-9-79		38.0	16.0	17.0		
P-13	5-9-79	67.51	43.0	14.0	15.0		
P-14	5-8-79	67.11	44.0	14.0	15.0		
P-15	5-8-79	65.31	45.0	12.0	13.0		
P-7	7-19-79	62.91	49.0	7.0	8.0		Background Well
P-7A	11-30-79	62.7	37.0	22.0	20.0		
P-11A	11-30-79	67.5	48.0	33.0	31.0		
P-12A	11-29-79	67.8	47.0	32.0	30.0		
X-1A	11-29-79	66.5	51.5	46.0	44.0		Recovery Well
X-5	11-30-79	67.1	42.0	27.0	25.0		Recovery Well
X-6	11-29-79	71.0	50.0	35.0	33.0		Test Boring
C-1	1-2-80		25.5				Test Boring
C-2	1-2-80		25.5				Test Boring
C-3	1-2-80		25.5				Test Boring
C-4	1-2-80		25.5				Recovery Well
W-17	4- -80	67.6	48.0	31.0	29.0		Recovery Well
X-2A	6-4-80	66.95	52.5	35.0	33.0		Recovery Well
E-1	10-8-81	66.90	44.0	29.0	unknown		Compliance Point
E-2	10-2-81	71.4	50.0	35.0	unknown		
E-3	10-2-81	70.6	51.0	36.0	unknown		
E-4	10-2-81	70.4	50.0	35.0	unknown		
E-5	10-1-81	70.2	47.0	34.0	unknown		Compliance Point
E-6	10-3-80	70.3	50.0	35.0	unknown		
E-7	10-7-80	67.4	47.0	32.0	unknown		Recovery Well
E-8	10-7-80	67.3	39.5	25.0	unknown		
E-9	10-7-80	67.5	45.0	30.0	unknown		Recovery Well
E-10	10-6-80	67.4	50.0	25.0	unknown		
E-11	10-3-80	70.1	45.0	30.0	unknown		Compliance Point

Table 7 (continued)

ID NO.	Date Installed	Surface Elevation	Total Depth	Depth to Screen	Depth to Sand Pack	Depth to Water Encountered	Comments
W-8	4-6-78		80.0			40.0	Boring
W-9	4-7-78		69.5			39.0	Boring
OB-2	12-11-80		55.0	10	10		
OB-3	12-10-80	67.6	64.5	10	10		
E-12	4-6-81	67.3	55.0	unknown	unknown		Recovery well
E-13	4-7-81	67.1	55.0	unknown	unknown		Recovery Well
E-14	4-8-81	66.8	52.0	unknown	unknown		
E-15	4-8-81	66.9	52.0	unknown	unknown		Recovery Well
E-16	4-9-81	66.9	52.5	unknown	unknown		
E-17	4-9-81	67.2	54.5	unknown	unknown		Recovery Well
E-18	4-9-81	67.2	47.0	unknown	unknown		Recoveery Well
E-19	4-7-81	67.1	55.5	unknown	unknown		Recovery Well
E-20	4-10-81	66.9	47.5	unknown	unknown		Recovery Well
E-21	4-10-81	67.0	42.0	unknown	unknown		
E-22	6-19-81	69.4	45.0	unknown	unknown		Compliance Point
E-23	6-21-81	70.1	45.0	unknown	unknown		
E-24	6-15-81	68.7	45.0	unknown	unknown		
E-25	6-16-81	69.4	45.0	unknown	unknown		
E-26	6-18-81	68.6	50.0	unknown	unknown		
E-27	6-18-81	69.6	45.0	unknown	unknown		
E-28	6-22-81	71.8	45.0	unknown	unknown		Well Destroyed
E-29	6-23-81	72.0	45.0	unknown	unknown		Well Destroyed
E-30	6-24-81	72.0	45.0	unknown	unknown		Well Destroyed
E-31	6-13-81	71.8	50.0	unknown	unknown		
E-32	6-18-81	71.4	45.0	unknown	unknown		
E-33	6-16-81	68.8	45.5	unknown	unknown		
E-34	6-15-81	68.0	50.5	unknown	unknown		
W-18	9-28-82	66.0	41.2	26.2	24.0	29.1'	
W-19	10-1-82	68.0	39.0	24.0	22.0	31.0'	
W-20	9-29-82		45.0	30.0	28.0		
W-21	9-30-82		44.3	29.3	27.0		
E-44	2-29-83		44.0	34.0	32.0	35.5	
E-45	2-27-83		43.0	33.0	33.0	35.5	
E-46	2-23-83		45.0	35.0	33.0	36.5	
E-47	2-22-83		45.0	34.0	32.0	36.5	
E-48	2-22-83		44.5	34.5	32.5	37.5	
E-49	2-23-83		45.0	35.0	33.0	36.5	

Table 7 (continued)

ID NO.	Date Installed	Surface Elevation	Total Depth	Depth to Screen	Depth to Sand Pack	Depth to Water Encountered	Comments
W-14	7-22-85	unknown	45.0	unknown	unknown		
001	1-1-85	unknown	45.0	unknown	unknown		
W-15	2-5-80	63.7	50.5	33.0	21.0		
W-16	2-5-80	63.1	50.5	30.5	28.5		
E-35	5-19-81	66.6	100.0	unknown	unknown		
E-36	5-11-81	63.4	100.0	unknown	unknown		
E-37	5-28-81	62.7	100.0	unknown	unknown		
E-38	5-21-81	62.7	101.0	unknown	unknown		
E-39	6-13-81	67.2	100.0	unknown	unknown		
E-40	6-8-81	65.4	100.0	unknown	unknown		
E-41	5-21-81	67.6	100.0	unknown	unknown		
E-3A		70.7					
E-6A		70.3					
E-42	3-10-83		75				
E-43	3-15-83		74.5				
P-16	5-20-82		40.0	20.0		33.0'	
SB-1	3-17-83		45.0		Chemical Odor	36.0'	Test Boring
SB-2	3-18-83		45.0		Chemical Odor		Test Boring
SB-3	3-21-83		45.0		Chemical Odor		Test Boring
SB-4	3-22-83		45.0		Chemical Odor		Test Boring
SB-5	3-24-83		45.0		Chemical Odor	36.0' 36.0'	Test Boring
SB-6			40.0		Chemical Odor		Test Boring
R-1							Recharge
R-2							Well
R-3							"
R-4							"
R-5							"
R-6							"
R-7							"
R-8							"
R-9							"
R-10							"
R-11							"
R-12							"
TB-1	6-6-81		21.5				Test Boring
TB-2	6-7-81		24.5				Test Boring
TB-3	6-6-81		23.5				Test Boring
TB-4	6-6-81		23.5				
E6A		No logs or data					Recovery Well
FD2		French Drain Risers					Recovery Well
FD1		French Drain Risers					Recovery Well

Special Studies:

A Gamma Ray Log Study was conducted during January 1980 of Trenches 1 through 14. Because very little information was retained during the construction of these trenches, TWC requested the study to determine the types of underlying soils, the depth of the trenches, and their total volumes.

Four core holes were drilled in the undisturbed sediments outside the landfill trench limits of the landfill trenches at the northeast (C-4), northwest (C-1) southeast (C-3), and southwest (C-2) corners. Fourteen "trench holes", TR-1 through TR-14 were made, in the trenchs themselves.

Lithologic and moisture content logs were presented of the core holes with their gamma ray logs. All four core holes showed clays and sandy clays (moisture content 16-22%) down to 13 to 17 feet. This was underlain by a silty sand (moisture content 3-8%) that was encountered through the total depth. Core hole C-3 did show a slightly more gradual change from a sandy clay (20% M.C.) to clay sand (11-12% M.C.), then silty sand (5%). These core holes were later cased with 8 inch steel casing and are now being used as leachate collection points.

The gamma ray logs for most of the trenches show a clay at the bottom of the trench. However, gamma ray logs for trenches 1, 4, 6, and 11 all showed sandy clays at the bottom. The cover letter to the report states that this sandy clay is impermeable. This is highly unlikely as a comparison of the moisture content percentages would indicate a more permeable material than the clay above. Therefore, these four trenches could be a source of possible releases to the ground water due to the sandy clay bottom.

Another special study was the 1982-83 Assessment of Contamination detected in Monitoring Well W-17. Early in 1982, TWC requested TECO to initiate a "Groundwater Quality Assessment Plan" to identify the source of contamination detected in well W-17. TECO submitted the plan on July 21, 1982 and on August 9,1982 it was approved by TWC. The Assessment Plan consisted of two phases. Phase I involved installation of four new wells around W-17. Phase II involved 1) gas

chromatography/mass spectrometry (GC/MS) of the W-17 contamination with that found in the northern end of the site, 2) analysis and (GC/MS) of liquid found in trenches 1 - 14 sumps, and 3) analysis of ground-water velocity in the vicinity of W-17.

TECO reported to TWC by December 1982 that the source of contamination was not ponds 1, 2, 3 or 4 as with the plume of contamination in the north. They had determined that the contamination came from trench 17/18, the old mixing basin. As described in the section on waste management units the old mixing basin was an open trench where bulk liquids were pre-mixed with on-site silty sand using a backhoe. The trench was unlined with only in situ clay as a base. Phase I of the assessment determined that given the reach of the backhoe and the depth of the in situ clay, the clay could easily have been breached in several places. Furthermore, during the time of operation when the silty sand was being used as an absorbant, sand could have been mixed with liquids beyond the field capacity.

TECO met with TWC to discuss the final results of the W-17 assessment and corrective action alternatives. The final determination was that the old mixing basin was the source of the contamination found in W-17 as proven by various tests and samples. The corrective action mutually agreed upon was to leave the waste in place and to upgrade the cap. The reasoning for this was that TECO felt that fluid migration from the old mixing basin had run its course and presented minimal future impact to ground water. No data of this fact was located in any file review. As a result of this assessment, monitoring well W-17 was equipped with a pump and incorporated with the other recovery wells.

Due to inconclusive data presented in the 1980 Gamma Ray Study, TWC requested in the 1981 Compliance Agreement for TECO to prepare a report <u>indicating whether or not landfill trenches 1 through 14 inclusive are underlain by a minimum of 3 ft of clay rich soil</u> below the bottoms of the trenches as determined in the Gamma Ray Log Study.

The Compliance Agreement specified that the program be composed of four soil borings sampled for soil specimens and laboratory testing for physical properties. This study was to be completed 120 days after February 26, 1981 or by June 25 1981. The borings were completed on time and logs were submitted with the June 25, 1981 ground-water recovery report. However, the formal report was not submitted until March 1982.

The four soil test borings varied in depth from 21.5 to 24.5 feet. Clay material was encountered to 3.5 ft in depth. This reflects fill material and the cap. Below this clay cap the boring encountered natural sandy clay and moderate plasticity clay. Below this clay was a very dense, silty, fine sand. Borings were terminated at this point after it was determined that these sands correlated with others encountered on site.

Compared to the Gamma Ray Log Study this second study showed in situ clay below trenches 1 through 10, with possibly less than 3 feet below trenches 4, 8, 9, and 10. Figure 6, 7, and 8 are drawings from the report showing a cross section of the trenchs and the relationship between the depth of the excation and the base of clay.

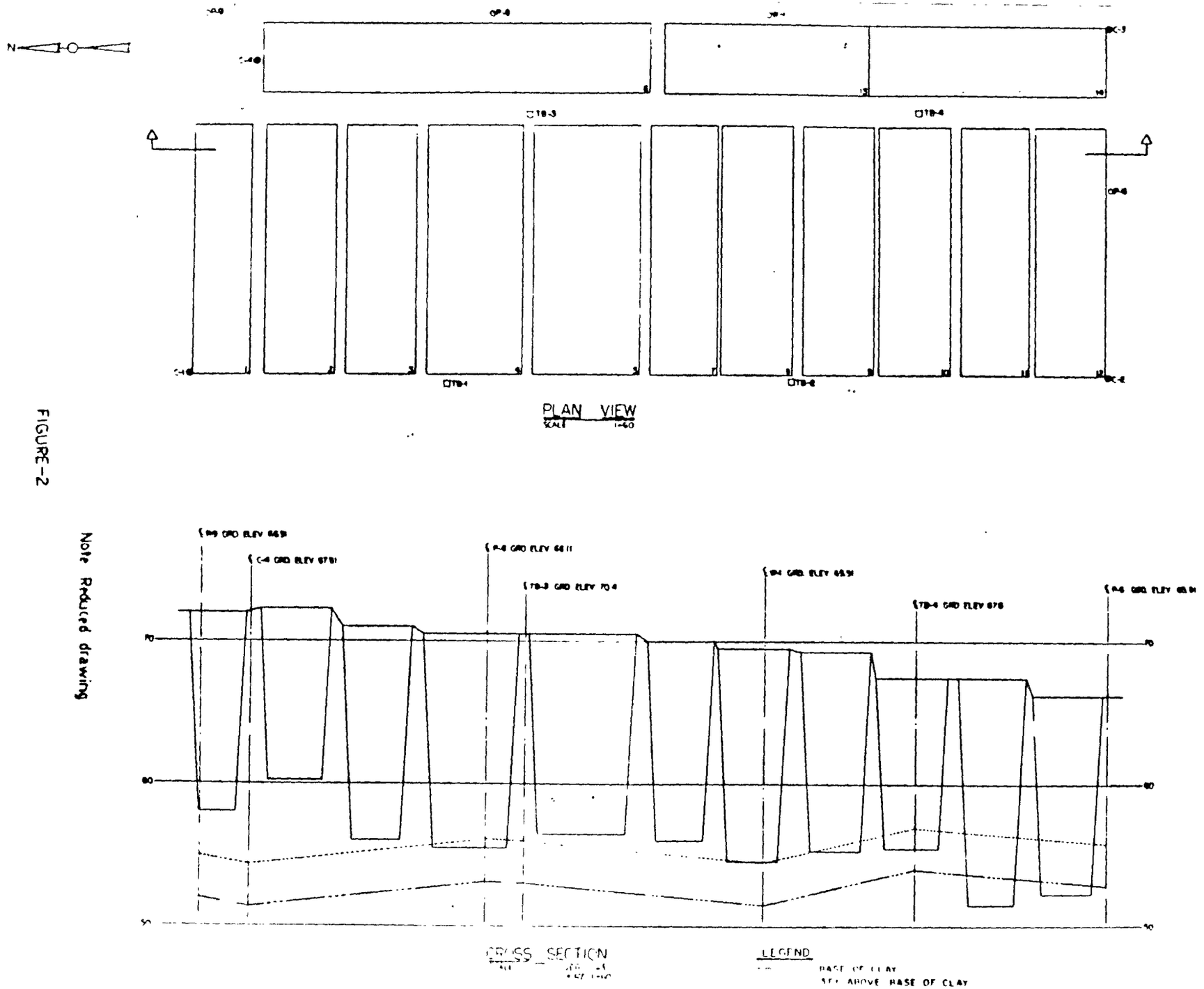
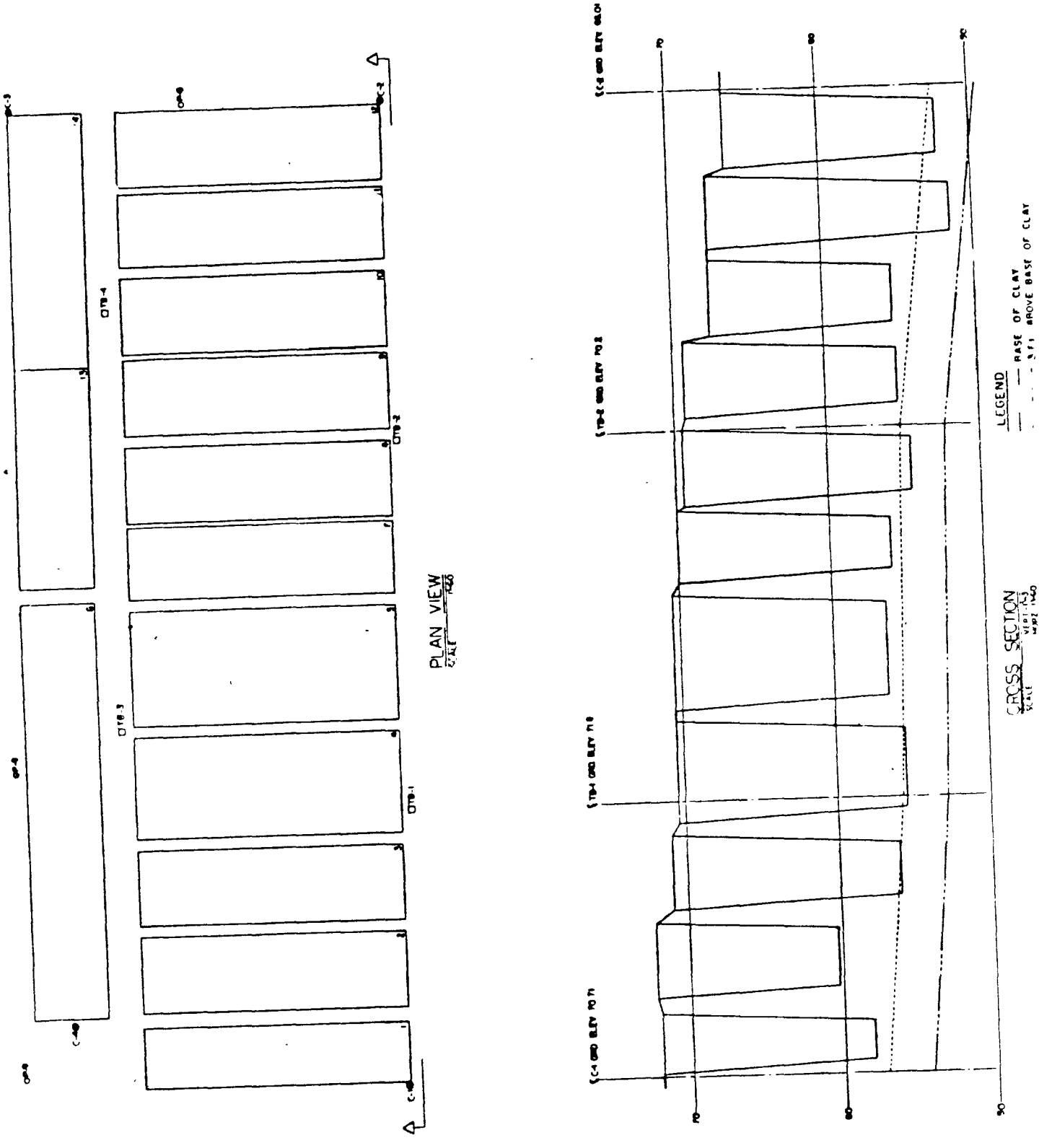


FIGURE-2

Note Reduced drawing

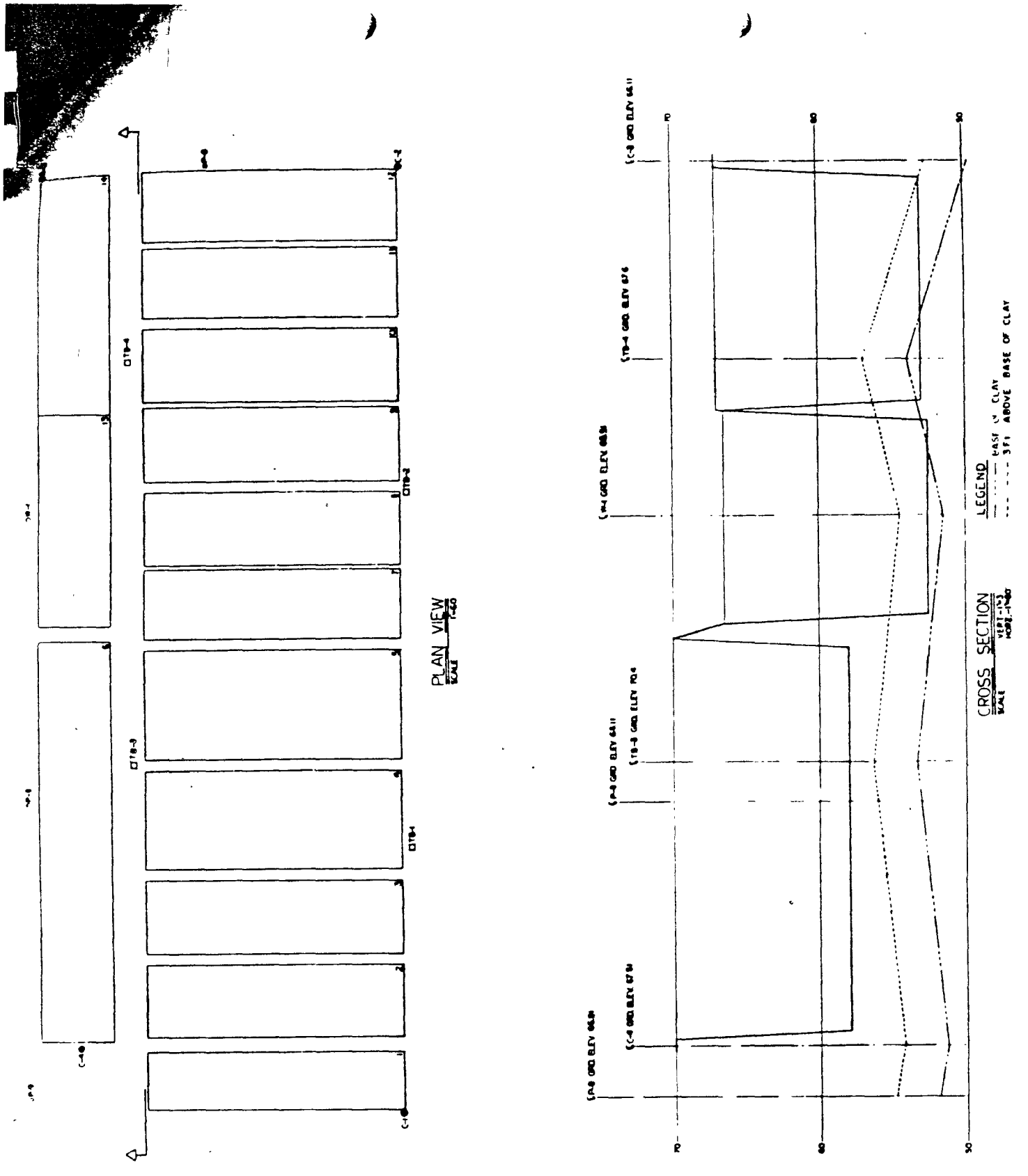
Figure 6 Cross Section of Trenches 1,2,3,4,5,7,8,9, and 10



Note: Reduced drawing

FIGURE-1

Figure 7 Cross Section and Planar View of Trenches 1,2,3,4,5,7, 8,9,10,11, and 12



Note: Reduced drawing

FIGURE-3

Figure 8 Cross Section and Planar Viwe of Trenches 6, 13, and 14

GROUND-WATER RECOVERY SYSTEM

The preceeding section dealt with the ground-water monitoring program, and the evolution of the monitoring system into a ground-water recovery and compliance monitoring system. These elements constitute a corrective action program as currently followed per the Compliance Agreement. This section will briefly describe specific aspects of the recovery system and how effectively it is working.

The recovery system at TECO was designed to: (1) recover contaminated ground water in the upper aquifer; (2) form a cone of depression that would impede any further movement of contamination; (3) form a recharge mound north (downgradient) of the plume in the upper aquifer that would prevent the migration of contaminants off site; and (4) treat recovered ground water which is discharged into an evaporation pond.

The system has three key components as follows:

1. A 500-foot Trench Drain
2. Twenty recovery wells and twenty-six monitoring wells
3. Twelve recharge wells/pits

Ground-water recovery began in June 1978 with the installation of a submersible pump in monitoring well W-4. Soon after pumping began the TOC value dropped to 6,000 ppm which was still high for the area, but it did show that ground-water recovery was feasible. Through mutual agrement between TWC and TECO it was decided that further ground-water recovery was necessary so as to form a cone of depression that would retard the movement of the plume of contamination. Therefore, in August 1979 pumps were installed in wells X-1 and X-3 to provide better recovery. Still the plume was not decreasing in size at a rate satisfactory with TWC and two more pumps were added in wells X-1A and X-6.

The ground-water recovery program was initially conducted by informal agreements between TECO and TWC. However, there was no definitive evidence that adequate recovery was taking place. Therefore, on April 3, 1980 the Executive Director of the Texas Water Commission instructed TECO to implement and maintain the facilities as set forth in their corrective action plan, until such time as all contaminated ground water was recovered and properly treated. This was the first formal instruction from TWC to TECO for any corrective action or ground-water recovery program.

TECO was also required by the April 3,1980 Directive to submit a monthly progress report on the recovery project to the state which contained:

a. The total volume of ground water recovered during the preceeding month;
b. Analysis of samples from all recovery and ground-water monitoring wells surrounding the contaminated area. These analyses at a minimum would report total organic carbon, chemical oxygen demand, specific conductivity, and pH;
c. Water level measurements accurate to + or - 0.1 feet from all recovery and ground-water monitoring wells at the facility, reported in above mean sea level;
d. Water level measurements shown on a potentiometric map of the shallow contaminated zone.

TECO was also notified that their progress in completing the recovery project, as reflected by the concentration of contaminants in the recovered ground water and the surrounding monitor wells, was to be reviewed semiannually, and if remediation was not reflected by the date submitted, the state would require additional measures to recover the contaminated ground water.

TECO (as a result of this directive) retained Law Engineering Testing Co., Houston, TX to develop an effective long-term ground-water recovery system. Law submitted a report that recommended 34 wells to be pumped to cause a cone of depression within the identified plume so as to stop the spread. It further recommended a ground-water recovery rate of 1,000,000 to 5,000,000 gallons per year.

The need for formal action was realized by TWC and a draft compliance agreement was negotiated and signed by both TWC and TECO on February 26,1981. As a result of this compliance agreement additional wells were installed and activated as recovery wells. TWC reevaluated the system in December 1981 to determine if it was performing as anticipated. It was determined that ground-water contours were being affected, but not enough to form the needed cone of depression.

During 1981, the system pumped slightly under 1,000,000 gallons in the first six months operating only during normal working hours, (Monday through Friday, 8am to 5pm). It was determined that the yield of the saturated zone was too low for the continous pumping needed to form a cone of depression. Therefore, TECO proposed in March 1982 modifications to the recovery system that would induce a larger cone of depression and an increased recovery rate. The modifications included a trench drain, changing the recovery pumps to eductor pumps, and installing recharge pits north of the plume.

The trench drain was installed in stages during June and August 1982, eductors were added in March 1983, and the recharge pits installed in mid-1985. All system components were activated as they were completed.

A review of the overall system has found the plan, construction, and maintenance to be satisfactory. One aspect which will keep it from achieving its full potential however, is the lack of storage space for the treated water. Because the current treatment system is not able to remove contaminants from the ground water to the level that meets TWC specifications the water is diverted to Pond 26 rather tha reinjected into the recharge pits north of the plume.

Trench Drain:

A Trench Drain (referred to as a French Drain in all TECO reports and correspondance) was installed along the long axis of the contaminant plume in the area of the old surface impoundment ponds 2, 3, and 4, (also known as trench 19). The trench drain consists of a 4 x 4 foot gravel drain surrounded by a geotextile fabric with a primary sump (FD-2) at the north, or downgradient end, and an alternate sump (FD-1) at the south, or upgradient end, (Figure 9), and is approximately 500 ft long. Data and potentiometric contour maps support the evidence that the trench drain is functioning as desired.

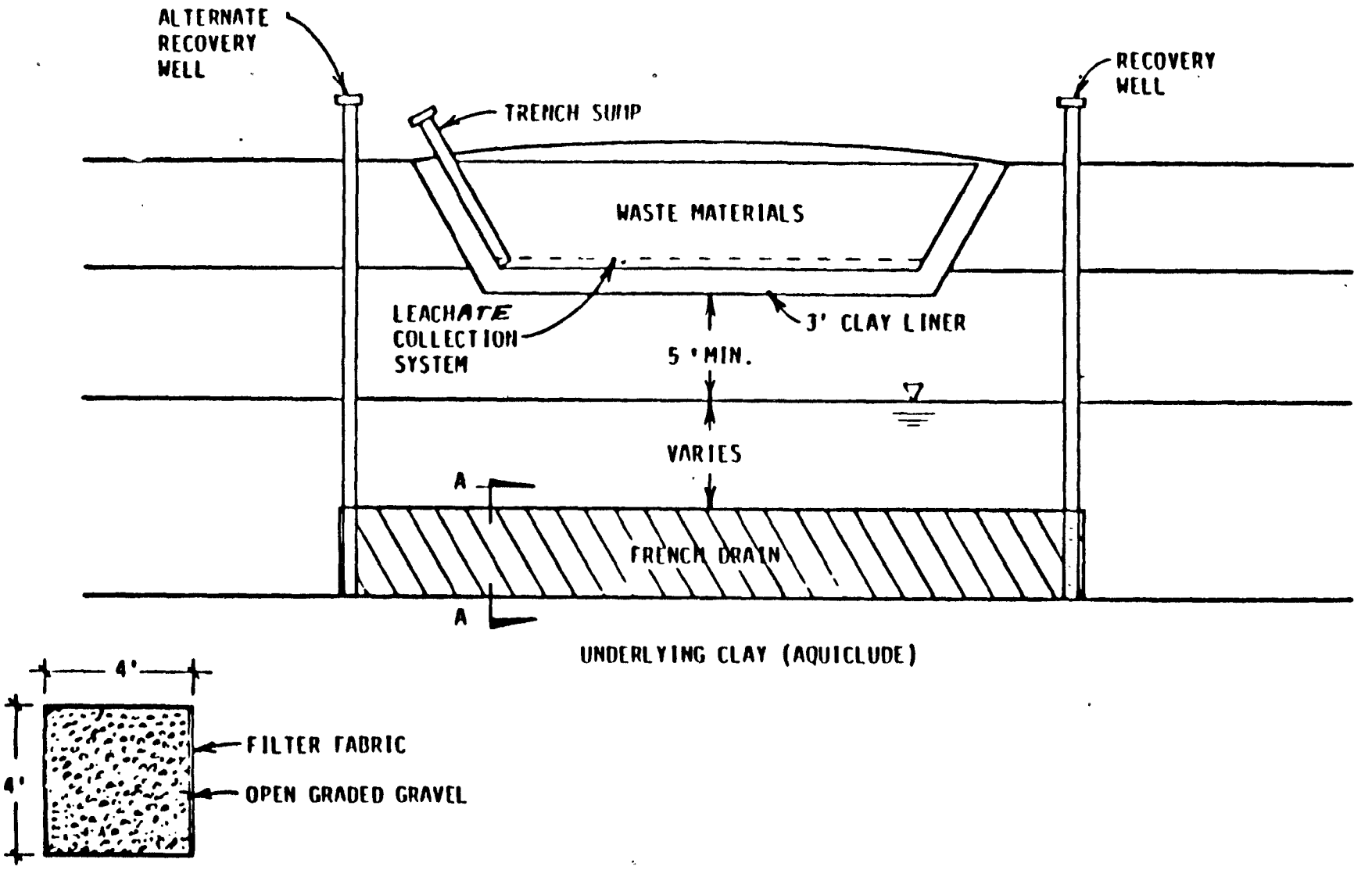
Recovery Well System:

Eighteen eductor and two sumersible pump equipped wells located within the plume of contamination form the recovery well system. Wells with the highest levels of TOC were selected to be equipped with eductors. Four of the five original eductor wells (X-5, W-4, E-9, and E-20) are still in the system. E-10, the fifth well, was deactivated because the TOC level dropped to 11 mg/l. Nine wells that originally had submersible pumps were equipped with educators (X-1A, X-2A, E-7, E-6A, E-19, E-18, E-17, E-16, and E-15). Five monitoring wells were also added to the system (E-1, E-13, E-12, X-3, and P-11) Figures 11 illustrates a cross section of an eductor well.

Two recovery wells are still maintained with submersible pumps (FD-2 and W-17). FD-2 is actually not a monitoring well, but a sump riser for the Trench Drain.

Figure 10 illustrates the eductor recovery well system.. Simply described, water is pumped from wells in the contamination plume to an 80,000 gallon storage tank, treated in the water treatment system, then finally sent to the evaporation pond (pond 26).

The current recovery well system is focused on the recovery of the known



FRENCH DRAIN INSTALLATION
(NOT TO SCALE)

Figure 9 Cross Section of Trench Drain installed at TECO facility
From: December 1985, TECO Ground-Water Compliance Plan, Vol. II, Section 9-1

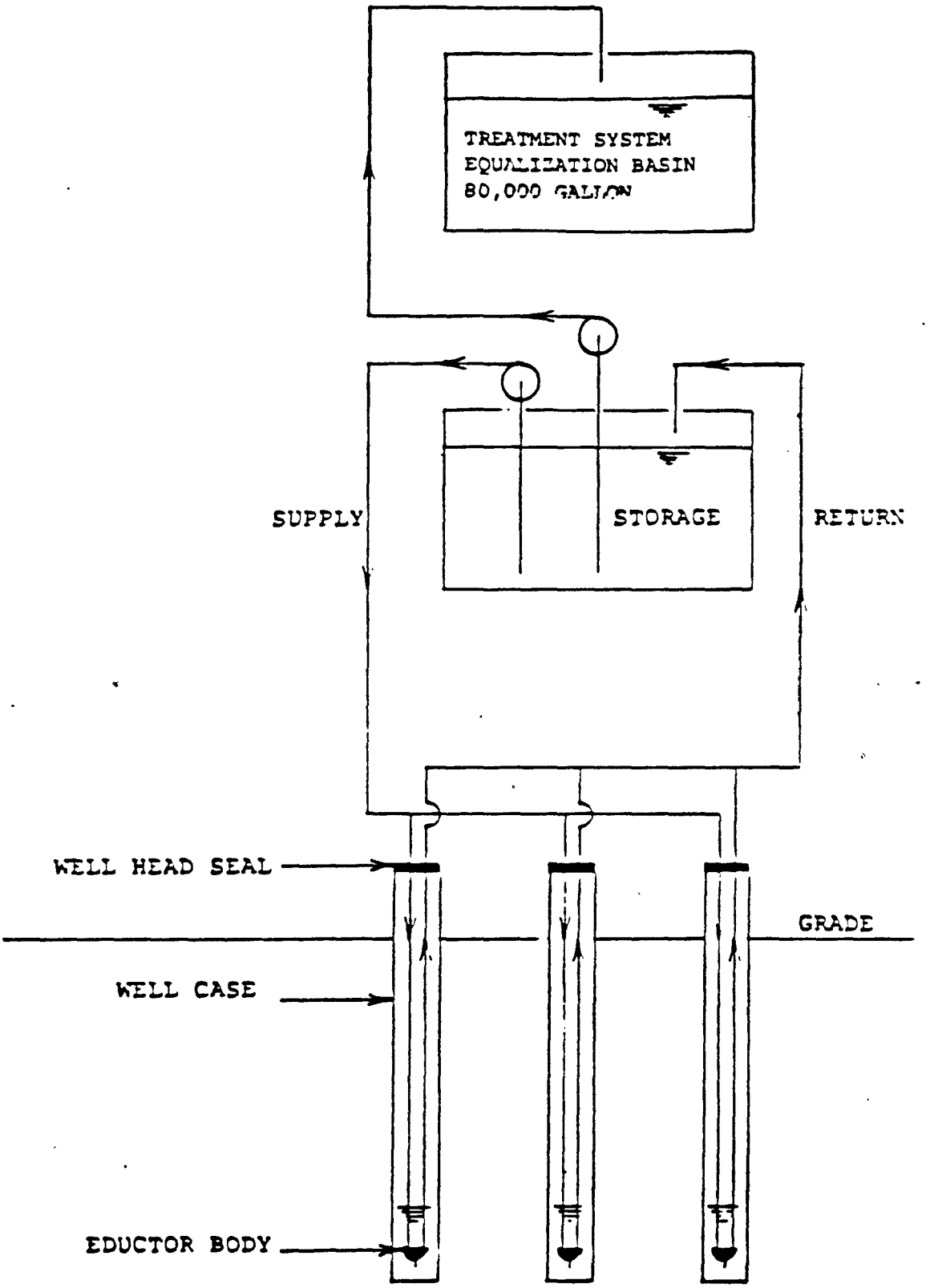
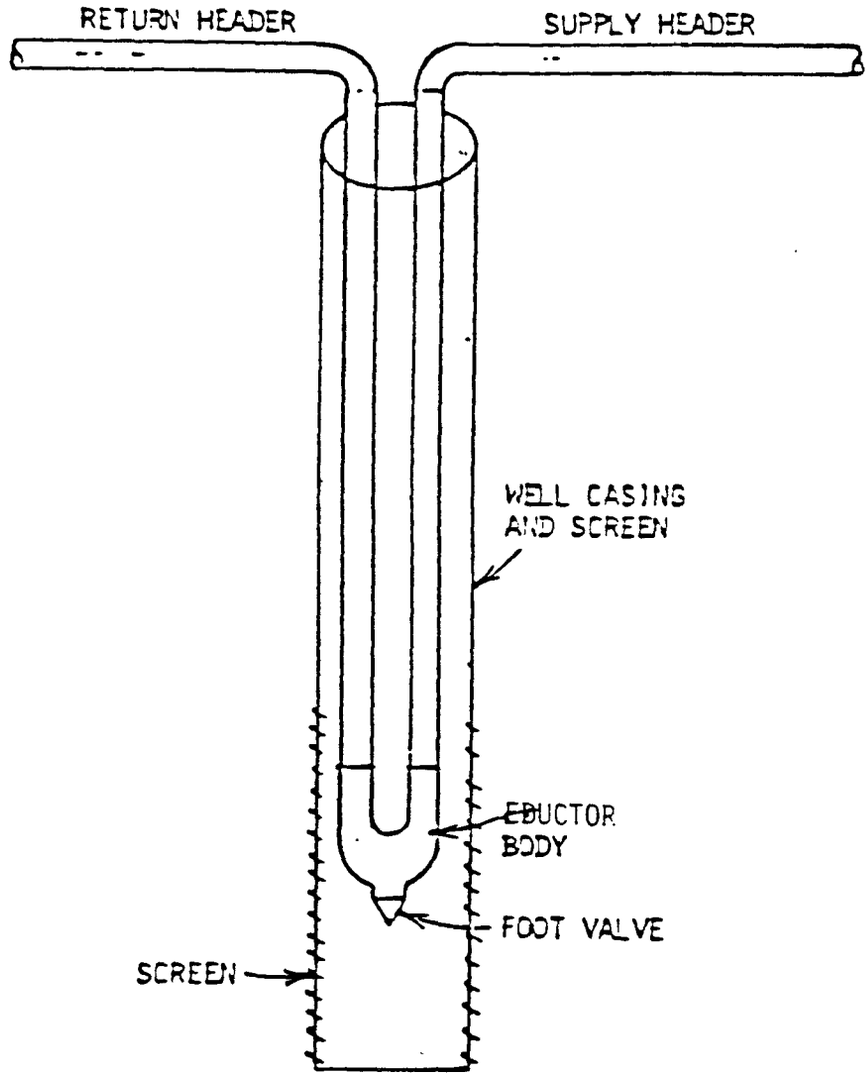


Figure 10 Eductor System Detail
From: December 1985, TECO Compliance Plan, Vol. I, Section 3-4



TYPICAL TWO PIPE EDUCTOR

Figure 11 Cross Section of Typical Eductor Pump
From: December 1985, TECO Compliance Plan, Vol. I, Section 3-4

TOC plume of contamination. Appendix VIII constituents identified within this area and elsewhere on site (discussed later in this report) indicate a need for an expanded recovery system and and assessment of a plume of contamination based on Appendix VIII constituents.

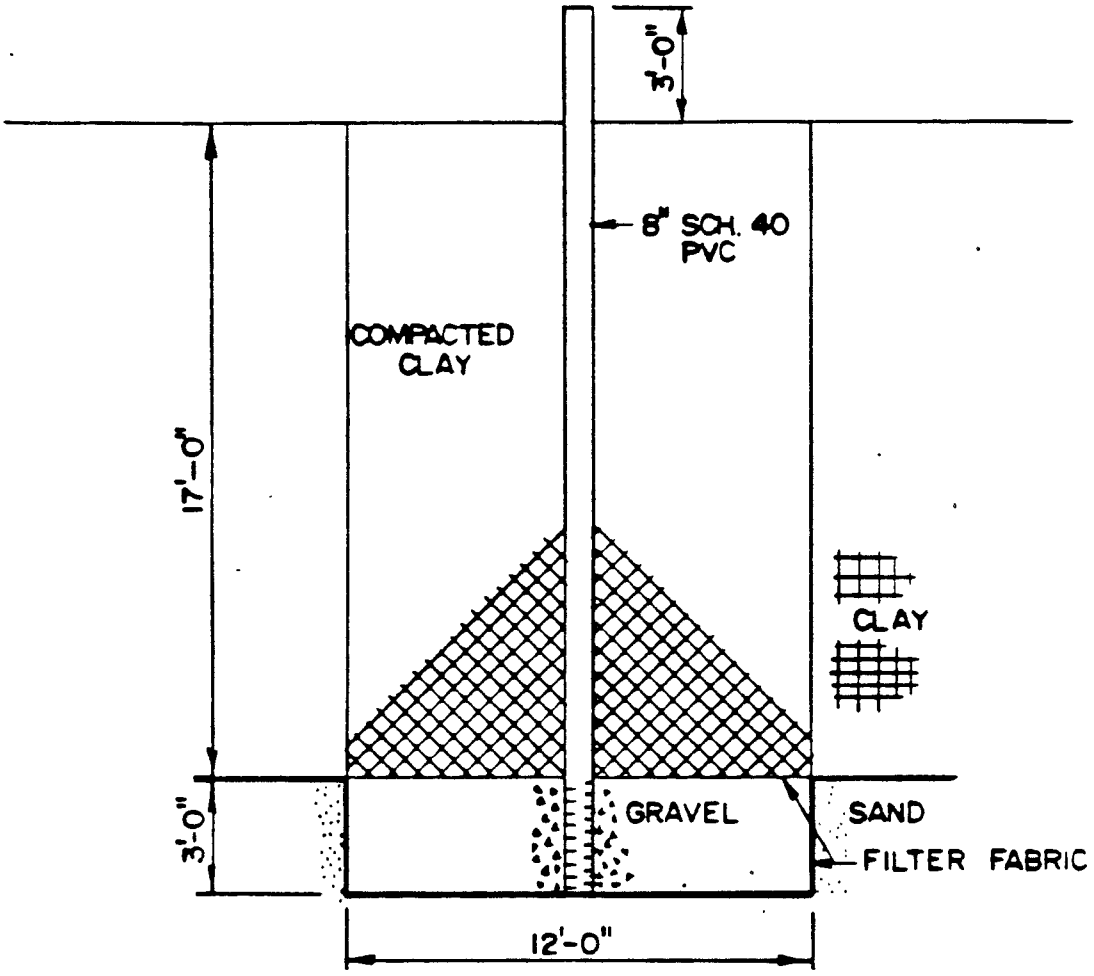
Recharge System:

The recharge system is designed to form a ground-water mound in the upper aquifer that will reverse the natural ground-water gradient and impede plume migration off the TECO property. Twelve recharge pits have been installed north of the contamination plume for this purpose.

Each recharge pit consists of a 12 x 12 foot trench dug into the upper sand below the surficial clay. An 8-inch PVC pipe which is slotted at the base is placed in the center of each trench. The trench is lined with a geotextile fabric to prevent siltation. Surrounding the slotted pipe the pit is filled with gravel. A surficial cap of compacted clay is designed to prevent the entrance of surface water. A constant recharge is provided by a manifold system from a central storage tank, (figure 10 and 11). The TECO Compliance Plan Application specifies for recovered ground water from the treatment plant to be used for injection. Presently water from the treatment plant does not meet acceptable levels for injection. These levels have been set at Primary Drinking Water Standards.

Most potentiometric maps produced by TECO (Attachment E) have shown a positive change in ground-water contours since early 1985 when the full system began operation. Thus indicating that a recharge mound has been formed along the downgradient edge of the contamination plume.

Even though the recharge system does appear to be affective some concerns still remain. The Task Force has questioned whether pumping of the deep sand at E-40 will induce contaminants to migrate vertically from the surficial aquifer.



Recharge pits are to be constructed as follows:

(a) A pit three (3) feet wide and twelve (12) feet long is to be constructed to below the surficial clay (approximately 17 feet);

(b) Drainage fabric should be placed in the bottom of the pit;

(c) An eight (8) inch schedule 40 PVC PIPE should be placed in the center of the pit;

(d) The last three feet of the pipe should be slotted;

(e) Gravel backfill to three (3) feet deep;

(f) Cover with drainage fabric;

(g) Backfill remaining hole with clay (compacted).

Figure 13 Cross Section of Recharge Wells (Pits) From: December 1985, TECO Ground-Water Compliance Plan, Vol. II, Section 5-1

No.	Description	By	Approval
REVISIONS			

EXISTING RECHARGE PITS

Drawn By: W.D.W.

Checked By:

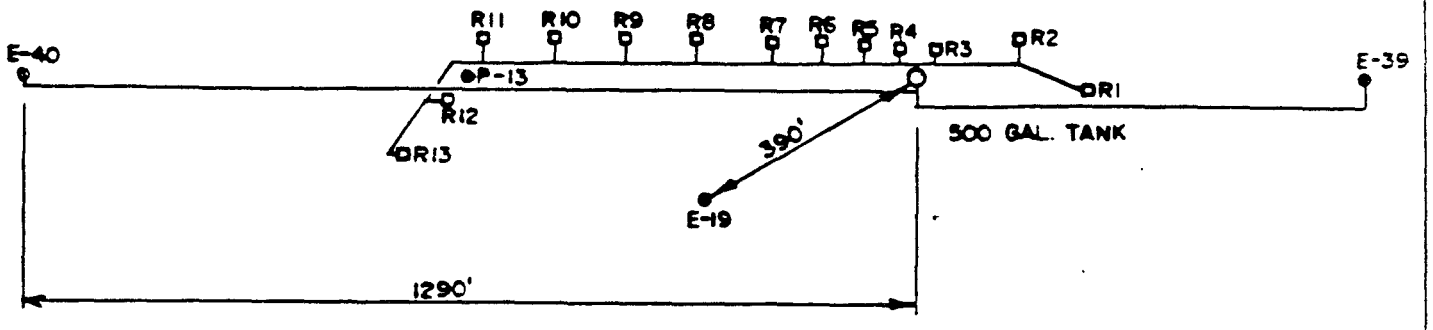
Date: 12/16/85

Scale: N.T.S.

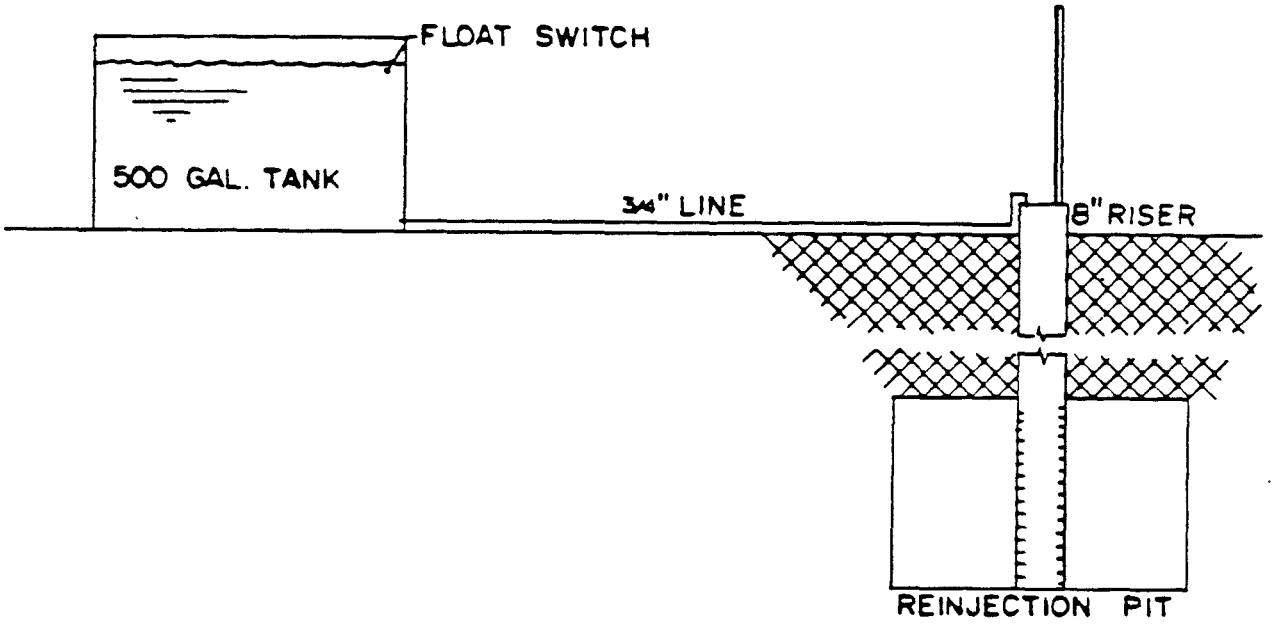
US Ecology

US Ecology, Inc.
9200 Shelbyville Road
Suite 319
Louisville, KY 40222

Drawing No. TX-8303-02-R1



PLAN



ELEVATION

Figure 12 Recharge Wells (Pits)
From: December 1985, TECO Ground-Water Compliance Plan, Vol. II, Section 5-1

No.	Description	By	Approval	Date
REVISIONS				

EXISTING RECHARGE PITS

Drawn By: N.D.H.
Checked By:
Date: 12/16/85
Scale: N.T.S.

US Ecology

US Ecology, Inc.
9200 Shelbyville Road
Suite 319
Louisville, KY 40222

TECO SAMPLE COLLECTION AND HANDLING PROCEDURES

An important portion of any ground-water monitoring program is how an owner/operator collects, handles, ships, and analyzes water samples. Field and laboratory methods used can easily affect sample analyses and poor methodologies could alter the true picture of the quality of the ground water beneath a facility.

The Task Force reviewed the sampling manual from the Part B application submitted by TECO, procedures described in their ground-water compliance plan, and observed techniques used by the field and laboratory technicians. Due to the length and detail of the written sampling plan only the major points and areas of deficiency will be covered.

Sampling:

During the inspection, samples were collected from 22 monitoring wells and 3 leachate collection sumps for analysis by EPA contractor laboratories as described in the section on Investigation Methods. Splits for all samples collected were provided for TECO and selected split samples were provided for TWC.

TECO sampling and laboratory personnel receive on-the-job training by the Safety Coordinator who oversees sampling operations. The TECO sampling team is comprised of an "Environmental Well Technician" and one of two laboratory technicians who assist in in situ testing and sample packaging. Through observations and questioning of TECO personnel,it was observed that there were some differences between written and actual sampling procedures.

The procedures are as follows:

1. The first step is to measure the depth to water using a weighted steel tape. The tape is decontaminated with distilled water between wells. It is not clear in the sample plan as to

what material the steel tape is constructed, how the tape is weighted, and how decontaminated. However, distilled water alone is not sufficient decontamination if hydrocarbons are suspected.

2. Total depth to bottom of the well is not always measured each time a sample is collected as indicated in the Sampling Plan.

The volume of water in the casing is determined using the depth to water measurement, total well depth, and casing diameter. The total depth usually is derived from the total casing length presented in the well construction records.

3. TECO uses dedicated bailers to purge and sample their shallow ground-water monitoring wells. During the inspection it was noted that modified four-inch PVC bailers were being used. The bailers were glue jointed with metal screws and had a PVC screen extension, for filtering sediment, attached to the bottom valve. Wells which were not being sampled as part of their monthly monitoring program, do not have dedicated bailers.

PVC bailers of this type are adequate for purging purposes only. Sampling equipment should be constructed of inert material, such as Teflon ® (stainless steel, though inert, is not recommended due to the natural salinity of the upper aquifer) and be constructed with bottom release valves so as to prevent sample agitiation. Furthermore, bailers with glued joints should not be left in the water but instead suspended above the static water level. Nylon and polyethylene line are being used to raise and lower the bailer. These materials are not recommended because it may not be possible to thoroughly decontaminate them, they tend to shred

with usage, and the materials may react with ground-water contaminants. Recommended materials include "Teflon"coated wire, single strand stainless steel wire, or a monofilament.

4. The purge volume is computed by multiplying the total volume by three. Three well volumes are removed prior to sampling. Those wells which have slow recharge rates are normally evacuated once to dryness. The sampling plan does not define what a low yielding well is, nor does it give any time span for determining such.

5. Purge water is collected in 55 and/or 85-gallon drums, then dumped in Pond 26.

6. Though not observed actually collecting a sample, TECO well and laboratory technicians were questioned and they explained how the samples are collected.

a. The dedicated bailer is lowered into the well using dedicated line.

b. As the bailer is being removed line is coiled in a bucket on the ground.

c. The bailer is then emptied by inversion directly into the sample jars.

d. All sampling containers are filled to overflowing with volatiles being filled first.

7. Prior to December 1985 all samples were placed in an ice chest with ice, and then taken to the on-site laboratory for pH, temperature, and conductivity testing. This was an unacceptable practice which was changed by the Chemical Safety Officer. The well technician now takes these measurements at the wellhead.

8. When the well technician collects samples, each bottle is appropriately labeled, sample appearance and odor noted, and

all pertinent well data recorded.

Documentation:

Samples are returned to the on-site laboratory where they are preserved, and sealed with a U.S.Ecology Custody Seal. Samples to be shipped to the U.S.Ecology Central Laboratory in Louisville, Kentucky are accompanied by their own Chain-of-Custody form and a Laboratory Request Form in an ice chest packed with dry ice and having a custody seal on the ice chest.

Samples to be analyzed at local contract laboratories within driving distance are preserved and packaged the same way. However, no outside custody seal is placed on the ice chests because they remain in the custody of the Environmental Well Technician until they reach the lab.

The Environmental Well Technician and on-site laboratory technician when interviewed understood the corporate sampling plan and appeared to be following the plan. No deficiencies were noted in the procedure for documentation and handling of the samples.

The maintenance area used for pump/bailer storage was inspected. It was noted that extra dedicated bailers were stored with line on hooks on the wall. Submersible pumps were stored upright, and unprotected with their bottoms on the floor. The maintenance area, though set aside from the other shop area, is arranged in such a manner that outside contamination could enter the area, and the area did not appear to be free of dirt and grease. This practice promotes the cross-contamination of equipment.

The shortcomings noted above could impede TECO from meeting full compliance with 40 CFR 265.90.

TECO SAMPLE ANALYSIS AND DATA QUALITY EVALUATION

This section provides an evaluation of the quality of monitoring data presented by TECO and their analytical procedures. Analytical procedures for ground-water samples and data quality were evaluated through laboratory inspections and the review of documents containing the required monitoring data.

TECO utilizes three laboratories on a regular basis:(1) On-site laboratory, (2) U.S.Ecology Central Corporate Laboratory, Louisville, KT, and (3) Jordon Laboratory, Corpus Christi, TX,. These laboratories were evaluated for their operating and analytical procedures, internal data reports, raw data, and quality control records. Also, key laboratory personnel were interviewed and analytical equipment inspected.

Other laboratories have been used for special sample analyses such as Environmental Testing and Certification, (ETC) Edison N.J., and Radian Laboratories, Austin, TX. ETC performed the July 1985 analysis of Appendix VIII constituents on four ETC environmental monitoring wells the results of which are in the 1985 Compliance Plan, Volume III. Radian Laboratories, Austin, TX performed the analysis of split samples collected during the Task Force Inspection, and were subject to a laboratory evaluation by the Task Force.

As of the time of the Task Force Inspection TECO was conducting monthly monitoring of the compliance point wells, background wells, deep wells, wells outside and wells inside the plume. As specified in the 1981 Compliance Agreement, these wells are analyzed monthly for pH, chemical oxygen demand, total organic carbon and specific conductivity. Due to TECO operating under the Compliance Agreement and an Alternative Monitoring Program sampling procedures and parameters as specified under 40 CFR 265.92 have never been conducted.

Four monitoring wells (P-7, W-4A, FD-2, and E-33) were analyzed for full Appendix VIII constituents in June/July 1985. The resulting data were presented in the Proposed Compliance Plan. Based on that sample analysis, parameters for quarterly sampling were selected and proposed in the Compliance Plan.

Five compliance point monitoring wells and the background well are to be analyzed quarterly for:

arsenic	toluene
phenol	chloroform
o-cresol	nickel
M & P cresol	carbon disulfide
benzene	chlorobenzene
methylene chloride	tetrachloroethylene
dimethyl phenol	1,1,1 tetrachloroethylene
methyl ethyl ketone	carbon tetrachloride
iron	aluminum

Annually the compliance point and background wells are to be analyzed for all Appendix VIII constituents to determine whether additional hazardous constituents are present in the uppermost aquifer.

The proposed quarterly or annual sampling described above will be conducted once the proposed Compliance Plan and Permit are subjected to Public Hearing opportunity and has been issued by TWC. This sampling should commence with the issuance of the permit and approval of the compliance plan application.

Laboratory Evaluations:

The purpose of the inspection was to determine the quality of the self-monitoring program and assess the reliability of the data reported by the facility for 40 CFR Parts 265.92 and 265.94. The off-site corporate laboratory, U.S. Ecology Central Laboratory, Louisville, Kentucky, (USECO) which conducts analyses of ground water for the Robstown facility was evaluated on August 6, 1986. Samples collected for analysis under Subpart F Ground-water Monitoring are currently analyzed by both onsite and off-site laboratories.

The laboratory portion of the inspection included:

- Reviewing the analytical methods for pH, specific conductance, total dissolved solids (TDS), total organic carbon (TOC), and chemical oxygen demand (COD).
- Determining whether the procedures are followed and reported in a way that is proper and consistent with 40 CFR Parts 265.92 (a) and 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants, Federal Register, October 24, 1984 and June 30, 1986.
- Reviewing the chain-of-custody procedures.
- Assessing the sample handling, preservation and holding time techniques.
- Reviewing the records for completeness, accuracy and compliance with the State and Federal requirements.
- Evaluating the quality assurance program.
- Assessing the adequacy of the facilities and equipment.

1. Personnel:

Six analysts are responsible for the RCRA ground-water analyses and have from one to twenty-one years of analytical experience. Five of

the analysts have college degrees and the sixth has twenty-one years of experience. The analysts appeared to be very competent and adequately trained to conduct the ground-water monitoring analyses.

2. Facilities and equipment:

The laboratory had ample space which included sufficient bench space for processing samples; storage space for chemicals and glassware, and portable instrumentation; and open floor space for large equipment such as refrigerators and incubators. The laboratory was equipped with sophisticated instrumentation that could be used for more complex analyses such as trace metals, cyanides, volatile and extractable organic compounds. The lab equipment was modern and appeared to be in excellent working condition.

3. Sample Containers, Preservatives Techniques and Holding Times:

The facility has generally followed the EPA guidelines for sample containers and preservatives for all parameters since March 1986. There were some holding time deficiencies for TDS during May and August, 1986. Prior to 1982, TECO used Jordan Laboratories, Corpus Christi, Texas to conduct the analyses. USECO in 1982 began conducting the analyses of the indicator parameters as stipulated in the Compliance Agreement with the Texas Water Commission. Samples that required preservation, were not preserved, but were shipped via Federal Express overnight in a cooler with dry ice. Samples for pH analysis were analyzed on site by TECO, but were conducted off site by USECO from 1982 to January 1, 1986. During the transition phase from January 1986 through March 1986, some sample containers for TOC/COD samples had wax-paper liners in the caps. If there was any contamination, the data would be expected to have a positive bias. The corporate laboratory did not flag these data in the report to TECO or the regulatory agencies.

a. pH: Samples for pH analysis from 1982 to January 1986 did not meet the required holding time.
Regulatory Requirement: The holding time for pH analysis is fifteen (15) minutes or less. See Table II, Required Containers, Preservation Techniques, and Holding Times, Federal Register, October 26, 1984.

b. TDS: Samples collected during May and July 1986, were not analyzed within the required holding time.
Regulatory Requirement: Samples for TDS analysis must be analyzed within seven (7) days of collection. See Table II, Required Containers, Preservation Techniques, and Holding Times, Federal Register, October 26, 1984 and January 5, 1985.

c. Suggestion: Data that do not meet stated quality assurance guidance such as TOC/COD analyses, should be noted in the report to the user.

4. Chain of Custody: The facility has adequate chain-of-custody procedures and documentation for the disposition of samples.

5. Methodology:
The methods in use for the RCRA self-monitoring program were generally in accordance with 40 CFR Part 265.92(a) for all parameters. Deficiencies were noted for the TDS, COD and TOC procedures.

The following observations were made during the evaluation:
a. TDS: The sample volume filtered provides an amount of residue in the weighing dish in excess of 200 mg in some cases. Periodically the lab recycles samples through the drying steps to check proper drying conditions.
Regulatory Requirement: Because excessive residue in the dish may form a water-trapping crust, limit the sample to no more than 200 mg residue. See Method 209B, Standard Methods; or Method 160.1, 5.3, EPA Methods.

b. COD: Several of the monitoring wells are located in a saline aquifer with chlorides in excess of 2000mg/L. The laboratory uses a modification of approved Method 410.3, High Level COD for Saline Waters. An equivalent amount of mercuric sulfate (10 mg/mg Cl) is added to the sample aliquot to remove any positive interference from chlorides that can be quantitatively oxidized by the dichromate. The amount of mercuric sulfate added is based on the conductivity of the sample. The mercuric sulfate is mixed with the sample in a separate beaker and an aliquot is removed for analysis. Because a precipitate can occur, any suspended solids present may be trapped and removed from suspension. Resuspension of the particulate matter would be necessary to obtain a representative sample.
Regulatory Requirement: The approved method requires preparing a standard curve of COD versus mg/L chloride, to correct for the positive chloride interfence. See Method 410.3, 7.7 EPA Methods. Also, a representative sample aliquot must be taken for analysis.

c. TOC: Samples from some of the wells in the contaminated zone contain particulate matter. The particulate matter (mainly clay particles) is allowed to settle, and the supernatant is removed for analysis. This modification could yield a fraction that would be defined as something less than the total organic carbon. The laboratory uses the acidification/purging method to remove the inorganic carbon (CO_2).
The form of carbon measured and reported would be the dissolved nonvolatile organic carbon (DNPOC). The purgeable organic carbon (POC) would not be measured.
Regulatory Requirement: The laboratory should use a homogeneous sample aliquot for analysis and define the data submitted to the regulatory agencies. See Method 505, 1b and 4b, Standard Methods; or Method 415.1, 3.1 and 5.2, EPA Methods.

d. Specific Conductance: Calibration standards are used daily, but are not always documented in the lab log.

Regulatory Requirement: Calibration standards must be documented daily and preferably in the chronological order as analyzed.

6. Quality Assurance and Data Documentation:

USECO had the Waste analysis Plan (Analytical and Quality Assurance Chapters) available for inspection. The quality assurance guidelines as stated in the Plan have not been fully implemented. The USECO laboratory has established a quality assurance program that consists of duplicates, spikes and reference standards to verify the quality of data for each parameter analyzed. These quality control measures are used to establish precision and accuracy control limits for some of the ground-water analyses. Instrument calibration records, except specific conductance, are maintained and temperatures of regulated devices are checked. Raw data calculations, gravimetric weighings, absorbance readings and TOC instrument performance checks are documented and maintained on file as required in the State and Federal requirements. Daily operating conditions and quality control practices are easily reconstructed.

Some additional quality assurance suggestions that would strengthen the quality of data produced are:

a. Continue the quality assurance program that consists of duplicates, spikes and reference standards to verify the quality of data for each parameter analyzed. Use these data to establish precision and accuracy control limits for all the ground-water analyses.
b. Conduct and document routine checks of the analytical balances with class "S" or equivalent weights in the milligram weight ranges encountered in the gravimetric tests, or when weighing primary standards.
c. Verify spectrophotometric calibration curves each day of use with a blank and at least one standard at mid-range of the calibration curve. Daily checks should agree within +/-10 percent

of the original curve or a new curve must be prepared. Verification data should be recorded and maintained with the appropriate sample data.

d. Check drying ovens and digestor block temperatures each day of use. The temperatures should be recorded on the bench sheets or in a logbook in order to document maintenance of required temperatures.

7. Performance Evaluation Data:
The USECO Laboratory has not participated in any EPA evaluation studies.

CONCLUSION

Based on the overall findings the laboratory appears to be providing acceptable quality data for specific conductance. The holding time deficiency noted for pH could cause the reliability of the data to be highly questionable from 1982 to January 1986. Considering the high mineral content of the samples, the holding time and methodology deficiencies noted for TDS would probably be very minor and would not cause the reliability of the data to be questionable. The deficiency noted for the COD procedure could cause the reliability of some of the data to be questionable. The chloride interference, if not corrected, would bias the data on the high side. Data from samples outside the saline zone (less than 2000mg/L chloride) would not be questionable. The deficiency noted for TOC could cause the reliability of some of the data to have a negative bias. Generally, the samples containing particulate matter are from the contaminated area and loss of any POC would probably be minor.

The laboratory Ground-Water Analysis Plan should be implemented. The Quality Assurance program as outline in the plan would strengthen the quality of data produced.

The laboratory is conducting the analyses on a monthly frequency as required in the Compliance Agreement. Parameters stipulated

in 40 CFR Part 265.92 (b)(1) Appendix III, 265.92 (b)(2) and 265.92 (b)(3)(iv), Total Organic Halogen (TOX) are not analyzed. However, the TOX would not be a reliable test in the presence of high chlorides. USECO has the capability to conduct analyses as required in parts 265.92, 265.94 and some of the Appendix VIII compounds.

Radian is under contract to Texas Ecologists, Inc. (TECO) to perform service on split samples collected during the Task Force inspection. An on-site evaluation of the Radian Corporation was conducted from August 6 through August 8, 1986, Austin, Texas. Metals Analyses were performed by Radian Analytical Services and the organic analyses by the Analytical Chemistry Department.

1. Personnel

   The qualifications of the key personnel are given in Section 4.0 of Appendix 1 (Analysis for RCRA Appendix VIII Compounds. Statement of Qualifications). The laboratories are appropriately staffed to perform the analytical services that were requested.

2. Facilities and Equipment

   The laboratories within the Radian Corporation complex in Austin are modern and are equipped with the analytical instrumentation required to perform the requested analyses.

3. Laboratory Administration, Methodology, and Quality Assurance

   During an entrance briefing, the organizational structure of Radian and the qualifications of the professional staff were presented. Following this briefing, an overall tour was made of the analytical laboratories during which the evaluators were shown the facilities and reviewed the analytical capabilities of the company.

   Several sample numbers were chosen at random from among those that had been assigned to samples submitted by TECO. The chain of events

taken from receipt of sample through analysis to data reporting was followed throughout the laboratory.

The chain-of-custody forms were examined and were found to be in order. Radian's system of sample control was reviewed; the samples are assigned a control number upon receipt, the number is logged into a computer, and the sample is prepared for analysis in a central laboratory. Security in the Radian laboratory complex is very strict, and when stored, the samples are kept in locked refrigerators within locked rooms.

The sample train was followed from the sample preparation laboratory to each analytical area where the analytical methodology was reviewed, the raw data was examined, and the quality assurance data were examined. At each point, the analytical methodology and the instrumentation used were discussed with both the analysts and the supervisors. The preventive maintenance was reviewed and the maintenance logs were examined for each class of instrument; these were found to be suitable and adequate. The laboratories were well equipped to meet the analytical requirements of the project; e.g. organic analyses were performed on gas chromatographs and gas chromotographs/mass spectrometers, trace metals on atomic absorption spectrophotometers and inductively coupled plasma (ICP) spectrometers, and other inorganic analyses on ion chromatographs and automated analyzers such as the Technician Auto Analyzer. Following the analysis of the samples, the analytical results are sent to the project manager who reviews and assembles these results and prepares a report.

4. Findings

The laboratories are modern, are well equipped with analytical instrumentation, and are staffed with well qualified analysts. However, while the laboratory may well have met the terms of its contractual commitment with respect to quality assurance, the following were found to be somewhat short of expectations:

(a) Radian Analytical Services does not maintain quality control charts routinely but rather determines whether acceptance limits have been met on control samples. Quality control charts have several advantages over control acceptance limits; these, among others, include: 1) control values may be trending either positively or negatively toward unacceptable limits and this trend may be spotted and the trouble corrected before the values reach these unacceptable limts; and 2) if the control values become consistently above or below the previously established mean, the analytical system should be examined. These are difficult to detect when viewing ranges of acceptable limits alone.

(b) Duplicate spikes are not run on a routine basis. Minimally duplicates and matrix spikes must be analyzed with each run, but it is highly recommended that duplicate spikes be used. One advantage of duplicate spikes is the following. If a particular analyte is present in below detection quantities, a duplicate may not be meaningful. However, by utilizing a duplicate spike, the analyst will have real numbers against which to make a comparison.

(c) Within the Analytical Chemistry Department, spikes are run with each 20 samples regardless of the time span in which these samples are analyzed. Blanks, standards, and controls should, at a minimum, be run with each batch of samples and should the batch contain more than 20 samples the controls should be run then on the prescribed basis.

5. Recommedations and Conclusions

Future contracts written for environmental measurements such as these, should at a minimum, contain the quality assurance measures in addition to those that may already be written into the contract.

It appears that Radian met the requirements of their contract with Texas Ecologists and that the data produced under this contract is of acceptable quality.

GROUND-WATER MONITORING PROGRAM PROPOSED FOR FINAL PERMIT

Volume IV(C) of Texas Ecologists Chemical Operations Program, Engineering and Construction Manual, submitted as part of their Part B Permit Application in November 1985 describes a revised ground-water monitoring program which TECO wishes to execute within the final permit. The proposed monitoring system plan was reviewed during the inspection. Comments concerning the plan were made to TECO representatives at that time.

Essentially the proposed plan consists of a detection monitoring system to be installed in the upper aquifer and operated in conjunction with the ongoing ground-water recovery system. The upper aquifer as defined by TECO is the upper sand and lower aquifers that are hydraulically interconnected within the boundaries of the facility. This definition agrees with the one set by the Texas Water Commission for the first aquifer to be monitored.

The detection monitoring system will consist of upgradient and point of compliance wells screened through the entire thickness of the saturated portion of the upper sand plus a minimum of five feet above the saturated zone.

The plan calls for installation and certification of the detection monitoring system within six months of permit issuance. During the inspection the point was raised that the detection monitoring system needs to be in place prior to permit issuance or clearly written into the permit with a schedule for completion.

The system will consist of many of the present monitoring wells and new wells to be installed approximately 200 feet apart along the southern boundary and northwestern corner boundary, 400 feet apart along the western side, and approximately 600 feet apart along the eastern boundary. The Task Force recommends that wells be installed in the second sand at a closer spacing along the eastern boundary. The eastern side of the facility is

upgradient for the shallow aquifer, however the flow in the Second Sand appears to be in an easterly direction. Deeper wells at a closer spacing are needed to monitor this second aquifer.

There is also a supplemental ground-water monitoring system proposed which will consist of existing wells within the interior areas of the facility. (First Sand - 001, P6, P4, W2, W7, E24 and E32; Second Sand- E35, E36, E37, E38, E39, and E41). Four new wells will be installed in the Second Sand,two will be adjacent to W-16 and W-15 and two evenly spaced between E36 and E38.

Except for the spacing along the eastern side of the facility the Task Force judged the proposed monitoring system to be adequate for detection monitoring needs of the facility. The majority of the comments from the Task Force were raised concerning well design and construction techniques.

Some of the points were:

1. Use of Schedule 40 or 80 PVC rigid pipe for well construction was questioned. A more inert material is recommeded for well construction due to potential reaction between organic contaminants and PVC. It was recommended by the Task Force that a more inert material (ie:Teflon ®) be used below the high water table level and PVC above that point);
2. The plan states the use of 0.01-inch slot size for the screen because experience indicated it prevented silt and sand intrusion . During the inspection a great majority of the wells were observed to contain silt intrusion. A number of reasons could have caused this, but it was recommeded that the use of 0.01 inch slot screen be re-evaluated based on a comparison between the gradations of native soils and the chosen sand pack.

® Teflon - registered trademark of E.I. DuPont Neimurs

3. A filter pack is to be placed a minimum of three feet above the screen. The Task Force recommends that the three feet be a maximum instead. It was also recommended that the filter pack be tremmied rather than placed by gravity.

4. A number of wells on site have been damaged by vechicles. It was recommended that "Bumper Guards" be set around the aprons of the new wells to prevent further damage.

5. Finally, it was proposed development of the new wells would be developed by bailing and pressurized air. This method is adequate, but a preferred method of "Surge Block and Pumping" was proposed by the Task Force. Proper development of a monitoring well is vital to consolidate the sand pack, remove drilling fluids or fines, and effect the greatest efficiency for well recharge.

6. TECO initially submitted to the Task Force a table of recharge rates. These rates were found to be in error by orders of magnitude.

   Task force recommends that further hydrological testing be conducted and a new recharge rates be established.

7. The proposed plan did not specify what parameters were to be analyzed. This needs to be clearly stated prior to initiation.

As with the proposed Compliance Plan the proposed detection monitoring plan is subject to Public Hearing opportunity and approval by TWC. This monitoring should commence with the issuance of the permit.

EVALUATION OF GROUND-WATER TASK FORCE SAMPLE DATA

This section presents an analysis of data collected during the inspection. Analytical results from and methods used on samples collected are presented in Attachment D.

Task Force personnel entered this inspection with the full knowledge that a plume of organic contamination (Figure 14) existed and that TWC and TECO had entered into a Compliance Ageement to correct the problem. The Task Force focused their sampling efforts not in re-establishing known contamination but in determining if the on-going corrective action was effective and if hazardous constituents had migrated to other areas of the site. Table 2 is a list of parameter tested and Table D-1 is a list of compounds found in the ground-water samples.

Data results as expected showed elevated levels of contaminants in the immediate area of the plume of contamination and the trench leachate collection sumps.

Well P-8, as shown in figure 14 was considered as part of the plume in 1984 but not in 1985, because its TOC level had dropped. However, the Task Force feels it is still contaminated due to the elevated levels of cadmium and selenium, and the presence of six volatile organics.

Immediately to the east of P-8 is well E-36. This is a deep well (100 ft.) and supposedly upgradient. The presence of 1.9 ppm TOX, 0.038 ppm phenol, 1.6 ppm POC and 3.2 ppm TOC raises the question of whether a vertical pathway exists to the lower aquifer in this area or if contaminants from the abandoned oil wells on site have influenced this second aquifer. The other deep well sampled (E-41) contained 0.015 phenols and much the same metals but at lower concentrations.

No specific organic compounds were detected in the upgradient wells P-7, W-16, and W-15. However, several metals were detected in each well. Arsenic, chromium, and mercury detected in well P-7 are of particular concern because they are at or near the Primary Drinking Water Standards (PDWS). The remainder of the contaminants found in P-7, W-16, and W-15 could be attributed to background readings or off-site influences from agricultural activities.

Two wells of particular interest to the evaluation were OB-2 and E-48. These two wells are to the north and downgradient of the plume, and northeast of the recharge wells. E-48 contained fifteen metals, only one of which (cadmium, 16ppb) was above PDWS. OB-2 contained seventeen metals, none of which registered above PDWS. Both wells had detectable concentrations of POX, TOC, TOX, total phenols, and other indicator parameters. The presence of these metals and indicator parameters indicates that low levels of contamination exist beyond the demarcation of the plume of contamination.

Monitoring well 001, which is immediately downgradient of trench 36, contained three volatile organics, sixteen metals, and five indicator parameters. None of the concentrations detected were above Primary Drinking Water Standards. Their presence does indicate low level contamination in that area.

Six wells (P-9,P-8, W-1, P-6, W-2, and W-21) adjacent to the first fourteen trenches were sampled to determine if the trenches were a source of contamination. W-21 was the second most contaminated well encountered during this inspection, (E-3 was first), indicating direct contamination from either these unlined trenches or the old mixing basin. All of the other wells showed varying levels of contamination indicating that these trenches are a source of contamination to the ground water and that the recovery operation for the mixing basin needs expansion.

Monitoring well W-6 contained seven organic compounds (trichlorethene, 1,1-Dichloroethene, 1,2-Dichloroethane, trichlorofluoromethane, methylene chloride, 1,1,1-Trichloroethane, and 1,1,2-Trichloroethane), manganese above PDWS, and total phenols. This clearly indicates ground-water contamination has occured in this area. Due to the fact that the well is located upgradient of the currently identified TOC plume of contamination but yet downgradient of the western most trenches there has apparently been a release of contaminants not previously identified.

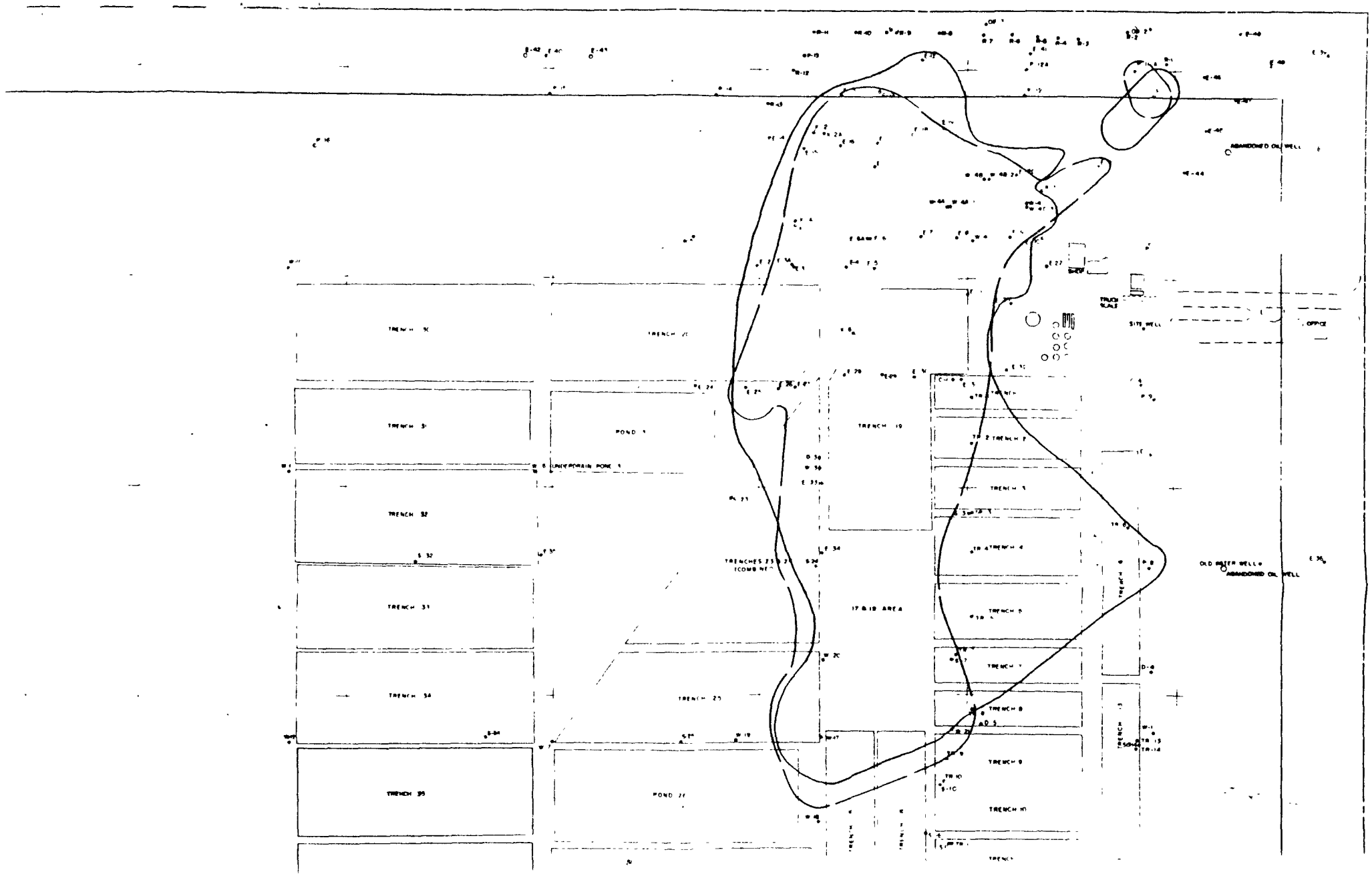


Figure 14 Extent of Contamination; from TECO December 1985 Compliance Plan, Attachment 3-1

October 1985 Plume Boundaries
October 1984 Plume Boundaries

REFERENCES

1) Environmental Protection Agency, "Draft - Ground-Water Monitoring Technical Enforcement Document", August 1985

2) Texas Ecologists, Inc., "Groundwater Compliance Plan Application", December 19,1985

3) Texas Ecologists, Inc., "Engineering and Construction Manual, Chemical Operations Program ", November 8,1985

4) Texas Ecologists, Inc., "Facility Operations Manual, Chemical Operations Program", November 8,1985

5) Texas Ecologists, Inc., "Sampling Manual, Chemical Operations Program", November 8, 1985

6) U.S.Department of Agriculture, "Soil Survey, Nueces County, Texas", Soil Conservation Service, June 1965

7) National Enforcement Investigations Center, "Ground-Water Monitoring Evaluation, Rollins Environmental Services (TX), Inc., Deer Park, TX", Denver:Environmental Protection Agency, July 1986

8) Mr. Kennith Aldrich, Multiple telephone conversations from Mr.Aldrich regarding the Texas Ecologists, Inc. facility and neighboring rural residences, July and August 1986.

Attacment A

1972 Permit

umber 39023

TEXAS WATER QUALITY BOARD
P. O. Box 13246, Capitol Station
Austin, Texas 78711

" Permit Number 39023 FOR AN INDUSTRIAL SOLID WASTE MANAGEMENT SITE issued under provision of Article 4477-7, Vernon's Texas Civil Statutes, and Texas Water Quality Board Order No. 71-0820-18."

Registrant		Site Owner	
Name:	TEXAS ECOLOGISTS, INC.	Name:	TEXAS ECOLOGISTS, INC.
Address:	P. O. Box 307 Robstown, Texas 78380	Address:	P. O. Box 307 Robstown, Texas 78380

Size & Location of Site: This 240 acre site is located approximately 4 miles south of Robstown, Texas in Nueces County and 3 miles east of State Highway 16. The site is fronted by a paved county road on the east.

Classification of Site: Class I

Waste Management Methods Used at the Site: 1) Reclamation and salvage of oils and other hydrocarbons; 2) Incineration of oils, solvents, hydrocarbons, greases and other combustible liquids; 3) Chemical treatment of acids, caustics, and oth chemical solutions; 4) Modified landfill of solid wastes and solids and sludges resulting from the treatment process.

Description of Waste Materials that will be Managed at the Site: Oils, solvents and other hydrocarbons; acids, caustics, and other chemical solutions including those containing heavy metals; mud-water-oil mixtures; and other solid and semi-solid wastes.

Standard Provisions: Acceptance of this certificate constitutes an acknowledgement that the registrant will comply with all of the terms, provisions, conditio limitations, and restrictions embodied in this certificate, and with the rules, regulations, and orders of the Board, and the laws of the State of Texas.

The legal description, as submitted in the application, is hereby made a part of this Certificate of Registration.

Upon final closing of the facility, the applicant shall be responsible for the proper maintenance of the facility for a period of at least one year.

Special Provisions:

1. All incineration devices and waste storage facilities must meet Texas Air Control Board standards for odors and emissions.

2. The Preliminary Certificate of Registration for an industrial solid waste management site issued for this site on April 11, 1972 is hereby superseded this Certificate of Registration #20306.

3. Disposal of wastes may not begin until the relevant facilities have been completed and inspected for completeness by the Texas Water Quality Board.

4. Authorization is contingent upon the company's execution of a performance bond to the Texas Water Quality Board in the amount of $20,000.00; said bond to be used by the Water Quality Board if needed to properly close out the site in the event of abandonment by the company prior to proper closing

5. At such time as earth work construction commences upon the site, a ditch sh be dug on the southern most boundary of the 240 acre site in order to drain surface runoff from the site into the large drainage ditch crossing the western portion of the site.

This certificate will be valid until cancelled or revoked by the Executive Director.

Issued this 19th day of July, 1972.

Executive Director

ATTACHMENT B

Compliance Agreement

COMPLIANCE AGREEMENT

THIS COMPLIANCE AGREEMENT IS ISSUED TO TEXAS ECOLOGISTS, INC. (TECO), SOLID WASTE PERMIT NO. 39023, ROBSTOWN, TEXAS, AND REPRESENTS A DETERMINATION THAT FORMAL ENFORCEMENT ACTION UNDER SECTION 26.123, TEXAS WATER CODE, AS AMENDED WILL BE WITHHELD SO LONG AS TEXAS ECOLOGISTS, INC., COMPLIES WITH THE COMPLIANCE SCHEDULE SET FORTH BELOW. THIS COMPLIANCE AGREEMENT SUPERSEDES THE DIRECTIVES FROM THE EXECUTIVE DIRECTOR DATED APRIL 3, 1980 AND DECEMBER 12, 1980.

1. Texas Ecologists, Inc., shall:

   a. Construct and operate the ground water recovery system as described and in accordance with the schedule contained in the proposal dated September 30, 1980 submitted to the Texas Department of Water Resources (TDWR) October 1, 1980, Attachment A, (with the exception that pond construction shall be accomplished by April 15, 1981) and in accordance with the Law Project #710012, prepared by Law Engineering Testing Company, Attachment B. A plot plan showing the location of each pumping well and observation well installed during each phase of this project shall be submitted to the Executive Director and TDWR District 12 office; and

   b. TECO shall construct Pond No. 26 and Pond No. 3 in accordance with the plans and specifications submitted to TDWR on January 20, 1981. Pond No. 26 shall be completed by April 15, 1981. Subsequent to the completion of Pond No. 26, TECO shall transfer water from existing water impoundment Ponds No.'s 2, 3 and 30 into new Pond No. 26.

c. Prior to placement of liquids in Pond No. 26, TECO shall submit certification in writing that all facility components have been constructed in accordance with specifications set forth in the proposal presented to TDWR on January 20, 1981, except as modified below.

Liners shall be constructed of clay-rich soils exhibiting the following physical properties:

Liquid Limit $\geq$ 30
Plasticity index $\geq$ 15
% passing No. 200 sieve $\geq$ 30
Coefficient of permeability $\leq 1 \times 10^{-7}$ cm/sec

Soil liners to be constructed shall be compacted in lifts not less than six (6) inches thick nor greater than nine (9) inches, and scarified to a minimum depth of two (2) inches prior to placement of the following lift. All compaction will be to 95% Standard Proctor density at or slightly above optimum moisture content.

Certification shall be prepared and sealed by a professional engineer with current registration pursuant to the Texas Engineering Practice Act. Required certification shall be in the following form:

This is to certify that the following facilities have been completed and that construction of said facilities has been in accordance with plans submitted to TDWR on January 20, 1981 and in compliance with the Compliance Agreement dated February 9, 1981.

(description of facility components)

Certification that Pond No. 3 has been constructed in accordance with plans submitted to TDWR on January 20,

1981 and meets the above specifications will also be submitted to TDWR prior to utilization of the pond.

2. Only recovered ground water that in the opinion of TECO presents no potential for causing odors or that has been treated by activated carbon absorption may be stored or disposed of in Pond No. 3. TECO may store/dispose of recovered ground water in other ponds on-site.

3. TECO shall submit a monthly progress report to the Executive Director which contains:

   a. The total volume of ground water recovered from each well during the preceeding month;

   b. Analyses of samples from all recovery wells and ground water monitoring wells located on TECO's property in the vicinity of the contaminated area. These analyses shall, at a minimum, report the concentration of Total Organic Carbon, Chemical Oxygen Demand, Total Dissolved Solids, pH, odor and appearance; and

   c. Water level measurements accurate to $\pm$ 0.1 foot from all recovery and ground water monitoring wells at this facility, reported in feet above mean sea level. The water level measurements shall be reported in tabular form and on an isopiestic map of the shallow contaminated zone in the vicinity of TECO.

   The first monthly progress report shall be submitted 30 days from the date of acceptance of this Compliance Agreement.

4. TECO shall submit a report annually to the Executive Director which evaluates the performance of the ground water recovery system. The first report shall be submitted one year from

the date of acceptance of this Compliance Agreement. If this report reveals that the ground water recovery system is not functioning to adequately contain all contaminants on-site or that cleanup is not being effected, the Executive Director may require the Company to develop and implement additional corrective measures. Additionally, should the monthly water level measurements taken after installation of the recovery well system shown in in Attachments A and B indicate that the ground water recovery system is not functioning adequately to effect a "cone of depression" in the piezometric surface in the contaminated area, the Executive Director may also require the company to develop and implement additional corrective measures.

5. Within sixty days of the date of acceptance of this Agreement, TECO shall install a minimum of nine (9) ground water monitoring wells in addition to those described in Provision No. 1.

   a. Two wells shall be located in the immediate vicinity (within 10 feet) of the locations of Borings No. 2 and No. 3 drilled April 19, 1979.

      These wells shall be completed through the total thickness of the silty sand, clayey sand zone shown on the logs of Borings No. 2 and No. 3 to exist below the depth of fourteen (14) feet below surface.

   b. Seven wells shall be located at or near the following site coordinates:

      N2325, E2980
      N2325, E4860
      N1075, E2980
      N1125, E4775

N3540, E4860

N3540, E2980

N3540, E4150

These wells shall be completed through the total thickness of and screened through the total saturated thickness of the first permeable water zone below the clay strata which exists at depths of 35 to 50 feet below surface.

c. Samples from these wells will be collected on a monthly basis and analyzed for Total Organic Carbon, Chemical Oxygen Demand, Total Dissolved Solids, pH, odor, and appearance. Water level measurements in each well should also be reported. Results of analyses from the initial sampling shall be submitted to TDWR within ninety days of the date of acceptance of this Agreement. Subsequent analyses will be submitted with the monthly progress report (Provision No. 3 above).

d. Logs for each of the nine monitor wells shall be submitted to the Executive Director within thirty days of well completion.

6. Within sixty days of the date of acceptance of this Agreement, TECO shall submit to the Executive Director cementing affidavits or other certification that surface casing in each of the three abandoned oil wells at the eastern border of the site (Nora Schulze No. 1, 2, and 3) is cemented through the entire thickness of fresh water bearing sediments (surface to 1,000 feet depth).

7. A copy of all reports required by this Agreement shall be submitted to the TDWR District 12 office.

8. Within 120 days of acceptance of this Compliance Agreement by TECO, TECO shall complete the program set forth below and

submit to TDWR a report indicating whether or not landfill trenches 1 through 14 inclusive are underlain by a minimum of 3 feet of clay rich soil below the bottoms of the trenches as determined in the report entitled "Gamma Ray Log Study, Texas Ecologists, Inc., Robstown Disposal System, Robstown, Texas" prepared by Moody's of Dayton, February, 1980.

This program will be composed of four soil borings sampled for soil specimens and laboratory testing for physical properties of those specimens. Testing shall, at a minimum, determine the liquid limit, plasticity index, and percent passing No. 200 sieve of each sample collected. The borings will be made at the following locations:

Two soil borings near just outside the western margin of the Trench 1-14 area and located at the approximate site coordinates of N2265, E3925 and N1908, E3921.

Two soil borings within the Trench 1-14 area but outside of trench boundaries and located at the approximate site coordinates of N2262, E4302 and N1711, E4300.

9. Within 365 days of the date of acceptance of this Agreement, TECO shall complete the excavation and removal of all sludges and contaminated soil from Pond 3-4. TECO shall take all measures necessary to minimize odors associated with this operation.

10. In the event the Company foresees it will not conclude one or more of the obligations set forth within the applicable deadline, the Executive Director may, upon application by the Company, extend the deadlines for a reasonable time provided the Company demonstrates it has used due diligence to accomplish the obligations of the Agreement.

11. The president or other authorized official of the Company shall sign this Compliance Directive, if accepted, and in any case this Directive shall be returned within 20 days of the date of approval by the Executive Director.

THIS COMPLIANCE AGREEMENT DOES NOT CONSTITUTE A WAIVER OR MODIFICATION OF ANY APPLICABLE REQUIREMENT AND IN THE EVENT LEGAL ACTION IS INITIATED, THE TEXAS DEPARTMENT OF WATER RESOURCES MAY SEEK CIVIL PENALTIES OR OTHER RELIEF FOR ALL VIOLATIONS, INCLUDING THOSE WHICH OCCURRED PRIOR TO THE ISSUANCE OF THIS AGREEMENT. SIGNING OF THIS AGREEMENT DOES NOT CONSTITUTE ANY ADMISSION OR ACCEPTANCE OF LIABILITY BY THE COMPANY NOR DOES THE COMPANY ADMIT THAT IT HAS VIOLATED ANY STATUES OF THE STATE OR RULES OF THE TEXAS DEPARTMENT OF WATER RESOURCES.

Approved this 9th day of February, 1981.

Harvey Davis, Executive Director
Texas Department of Water Resources

Approved this 26th day of February, 1981.

S. V. Wright, Jr.
Vice President, Operations
US Ecology, INC.

(Signature and Title of Officer)
Texas Ecologists, Inc.

ATTACHMENT C

Facility Maps and Cross Sections

Attachment C Contents

C-1 West	TECO Facility Plan
C-1 Center	TECO Facility Plan
C-1 East	TECO Facility Plan
C-2	Cross-section Locations
C-3	Cross-section A-A'
C-4	Cross-section B-B'
C-5	Cross-section C-C'
C-6	Cross-section West-East
C-7	Cross-section South-North
D-8	Location of Task Force Sample Points

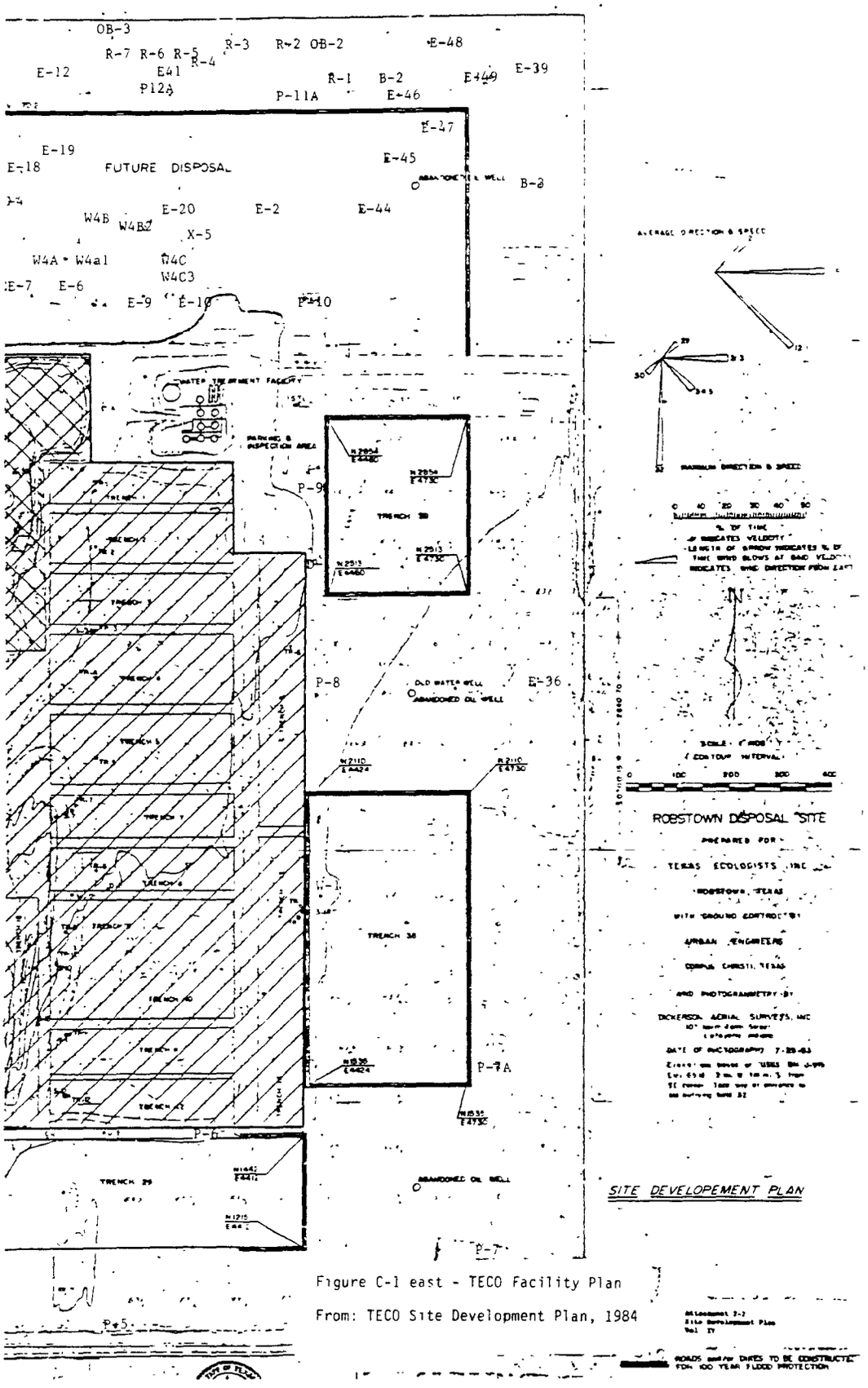


Figure C-1 east - TECO Facility Plan

From: TECO Site Development Plan, 1984

Figure C-1 center-TECO Facility Plan

From: TECO Site Development Plan, 1984

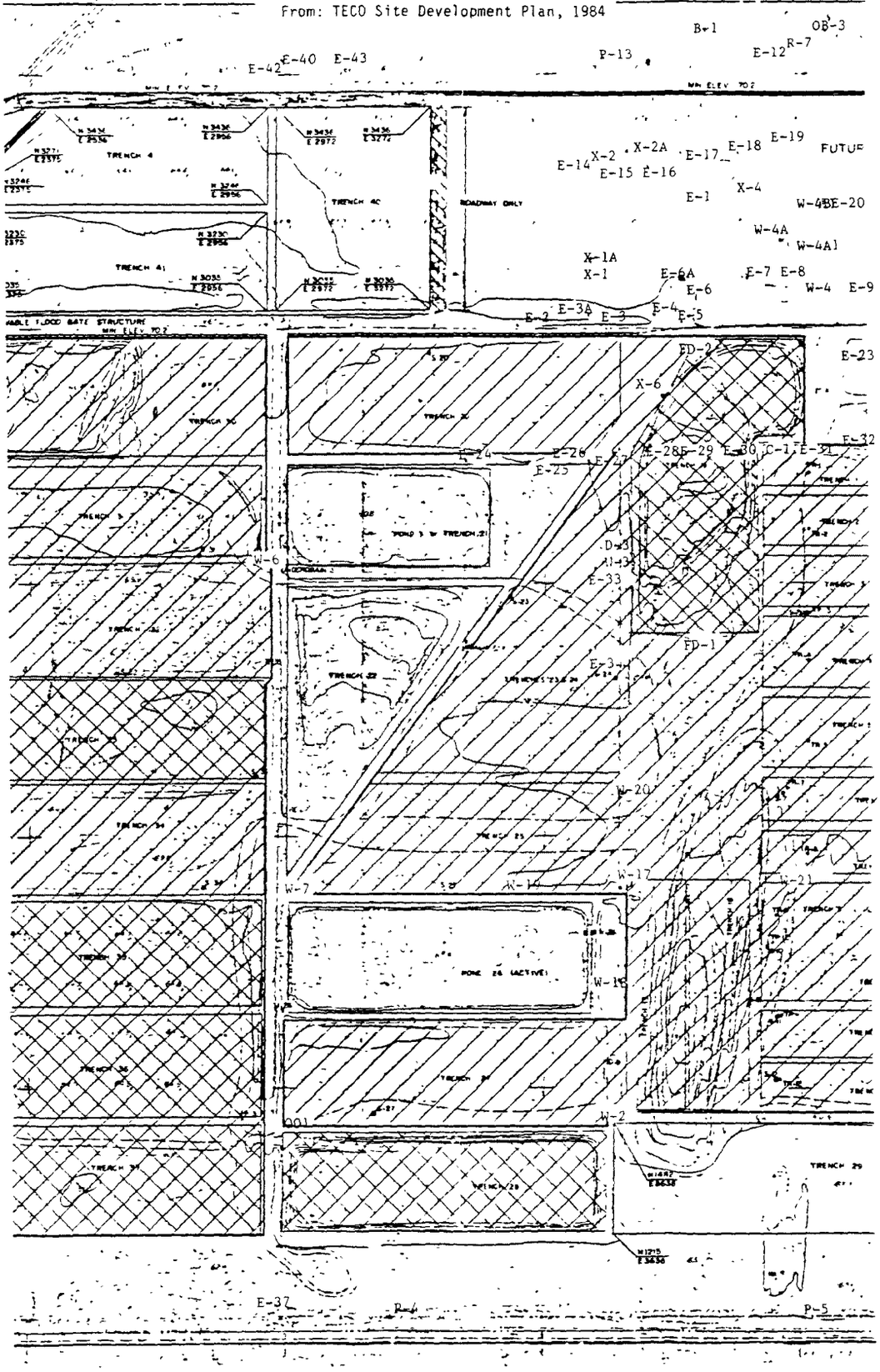
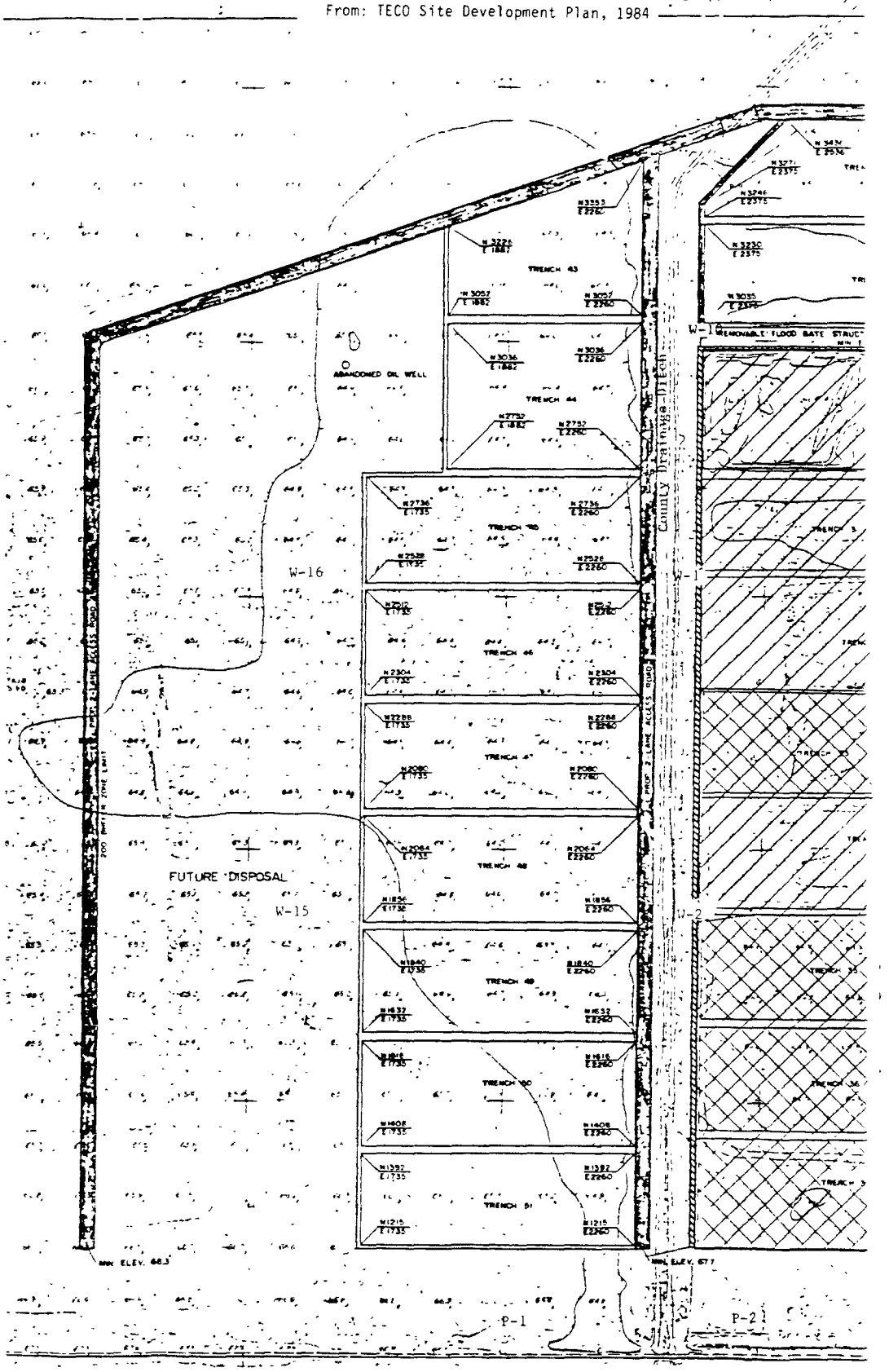
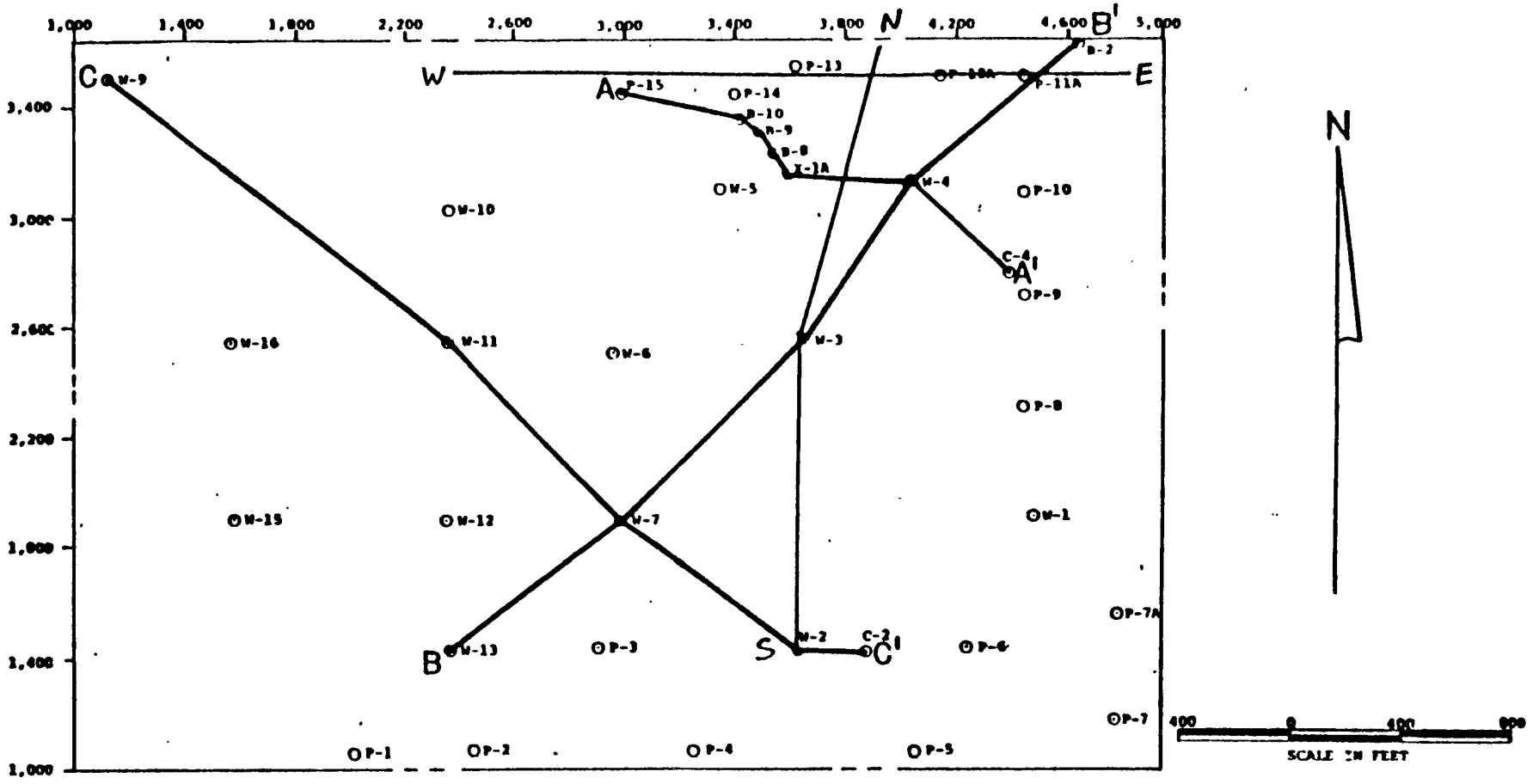


Figure C-1 west - TECO Facility Plan
From: TECO Site Development Plan, 1984





LEGEND

A —— A' BORING
STRATIGRAPHIC CROSS SECTION
SITE BOUNDARY

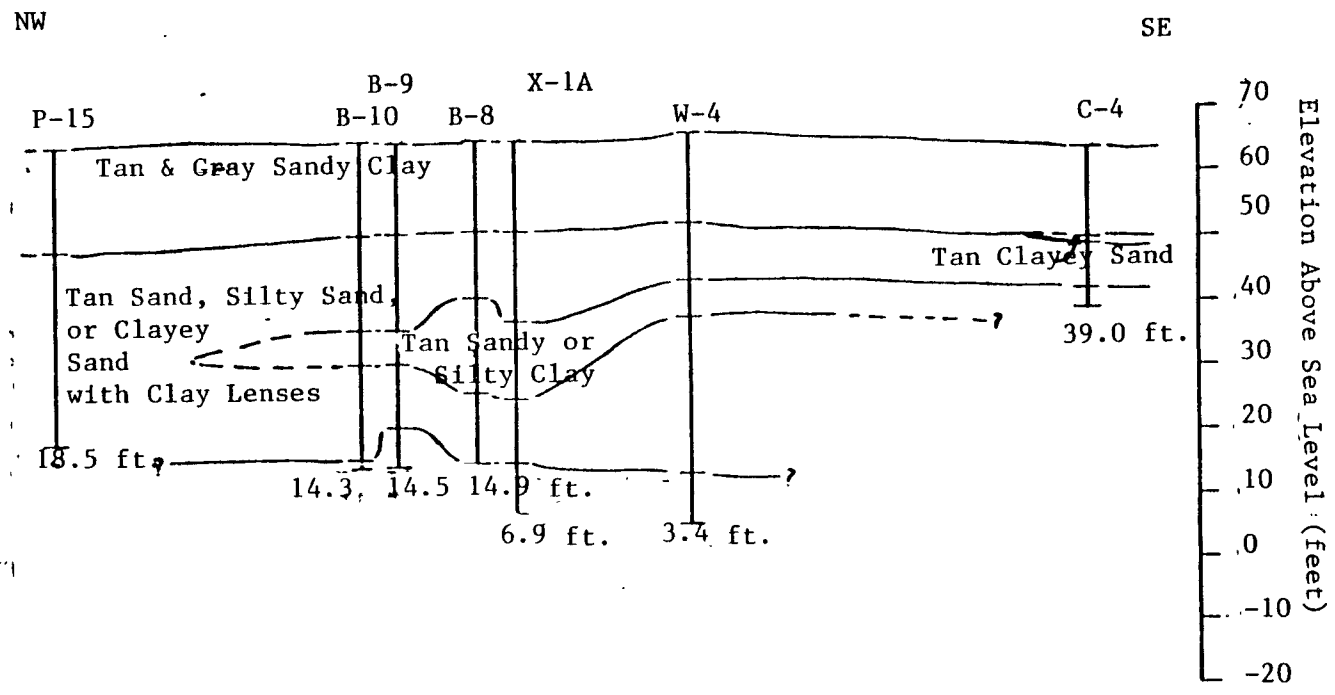
LAW ENGINEERING TESTING COMPANY

JOB NUMBER 710012.72-A

DAM MAP
TECO ROOSTOWN SITE

FIGURE 5

Attachment C - 2 Cross-section loca'ions; A- A', B-B', C-C' prepared by TECO consultants, Law Engineering; W-E and N-S cross sections prepared by Paul Lewis, TWC

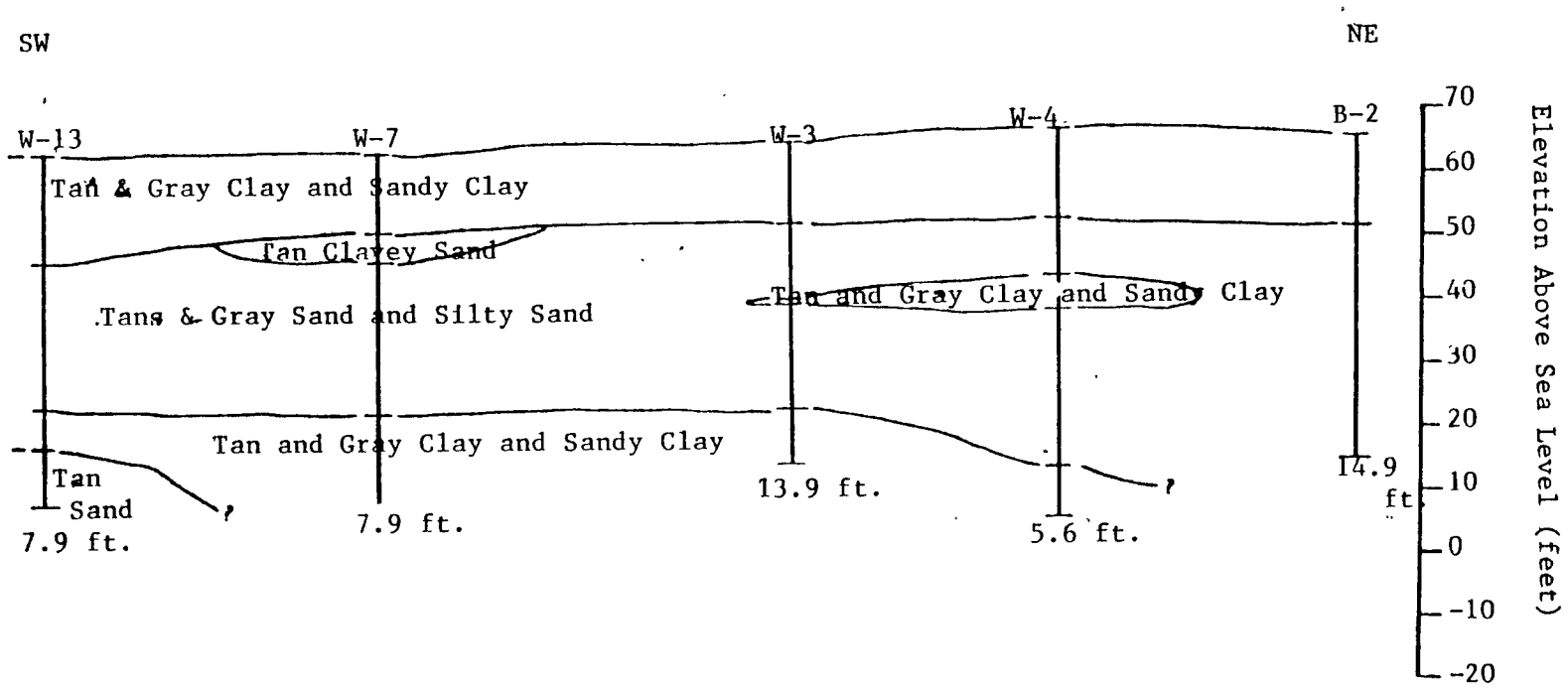


LAW ENGINEERING TESTING COMPANY

JOB NUMBER 710012.72-A

STRATIGRAPHIC SECTION A-A'

FIGURE 7

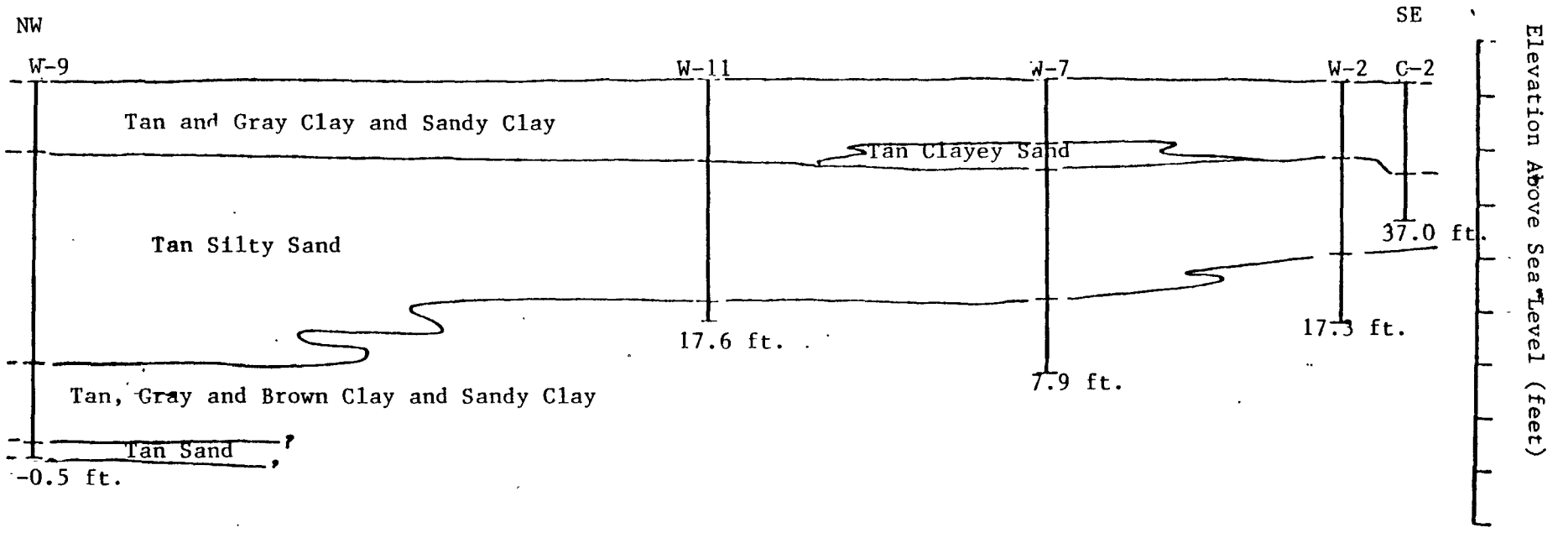


LAW ENGINEERING TESTING COMPANY

JOB NUMBER 710012.72-A

STRATIGRAPHIC SECTION B-B'

FIGURE 8

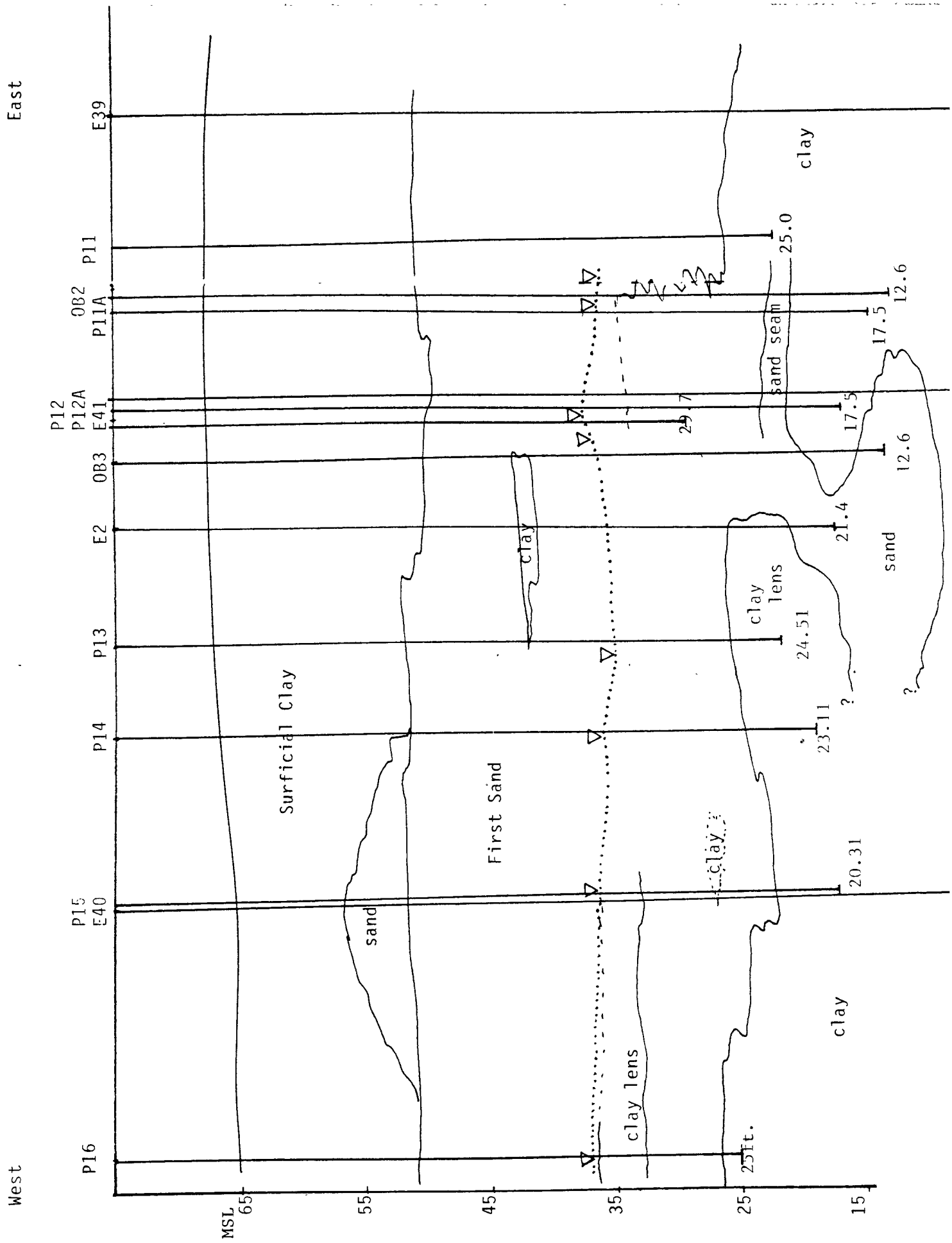


LAW ENGINEERING TESTING COMPANY

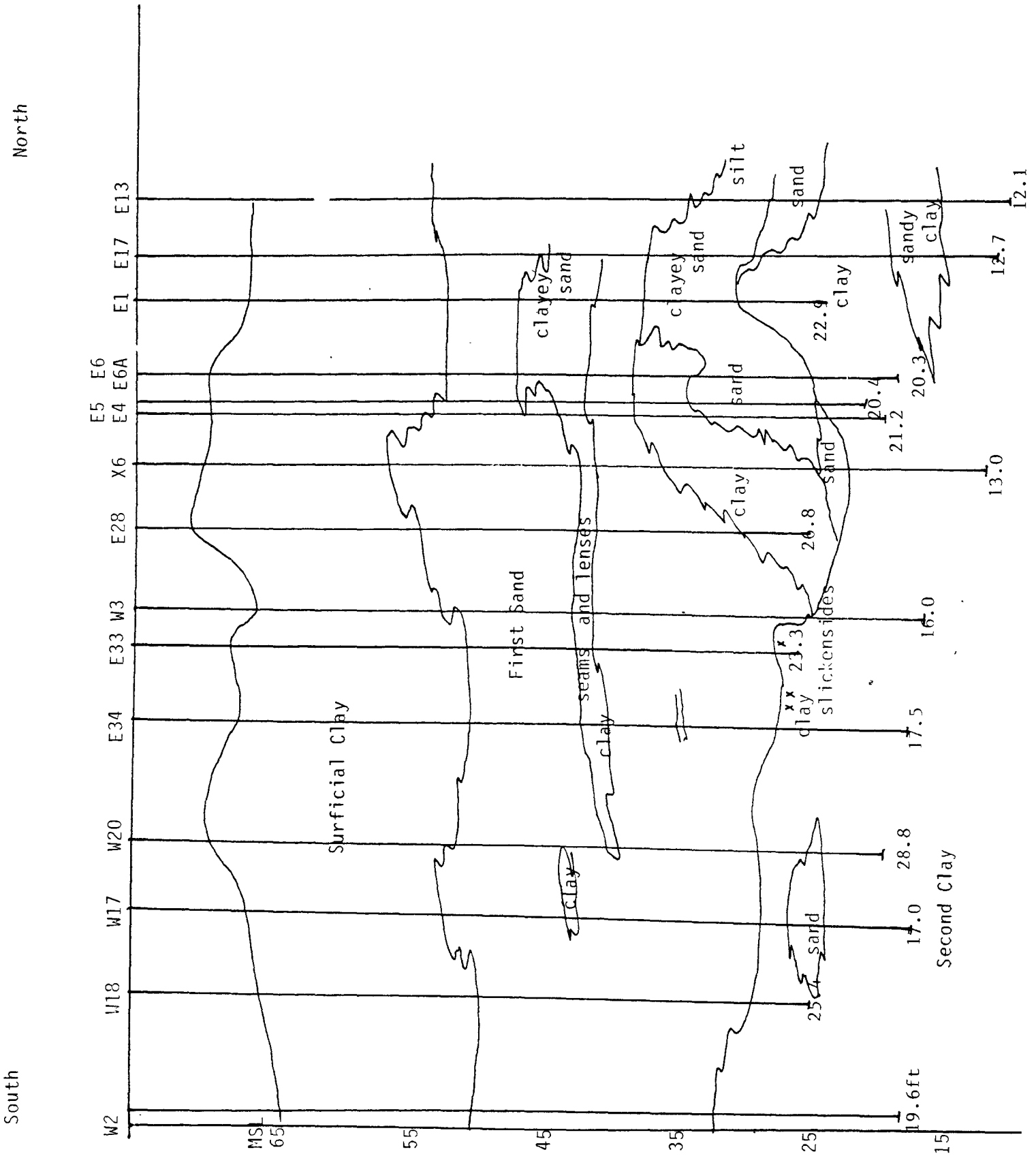
JOB NUMBER 710012.72-A

STRATIGRAPHIC SECTION C-C'

FIGURE 9



Attachment C-6 West East Cross section, from 1985 TWC Compliance Monitoring Evalu
Horizontal scale 1"=300'
Vertical Scale 1"=10'



Attachment C - 7 South - North Cross section
Horizontal Scale 1"=300'
Vertical Scale 1"=10'
From 1985 Compliance Monitoring Evaluation prepared by TWC.

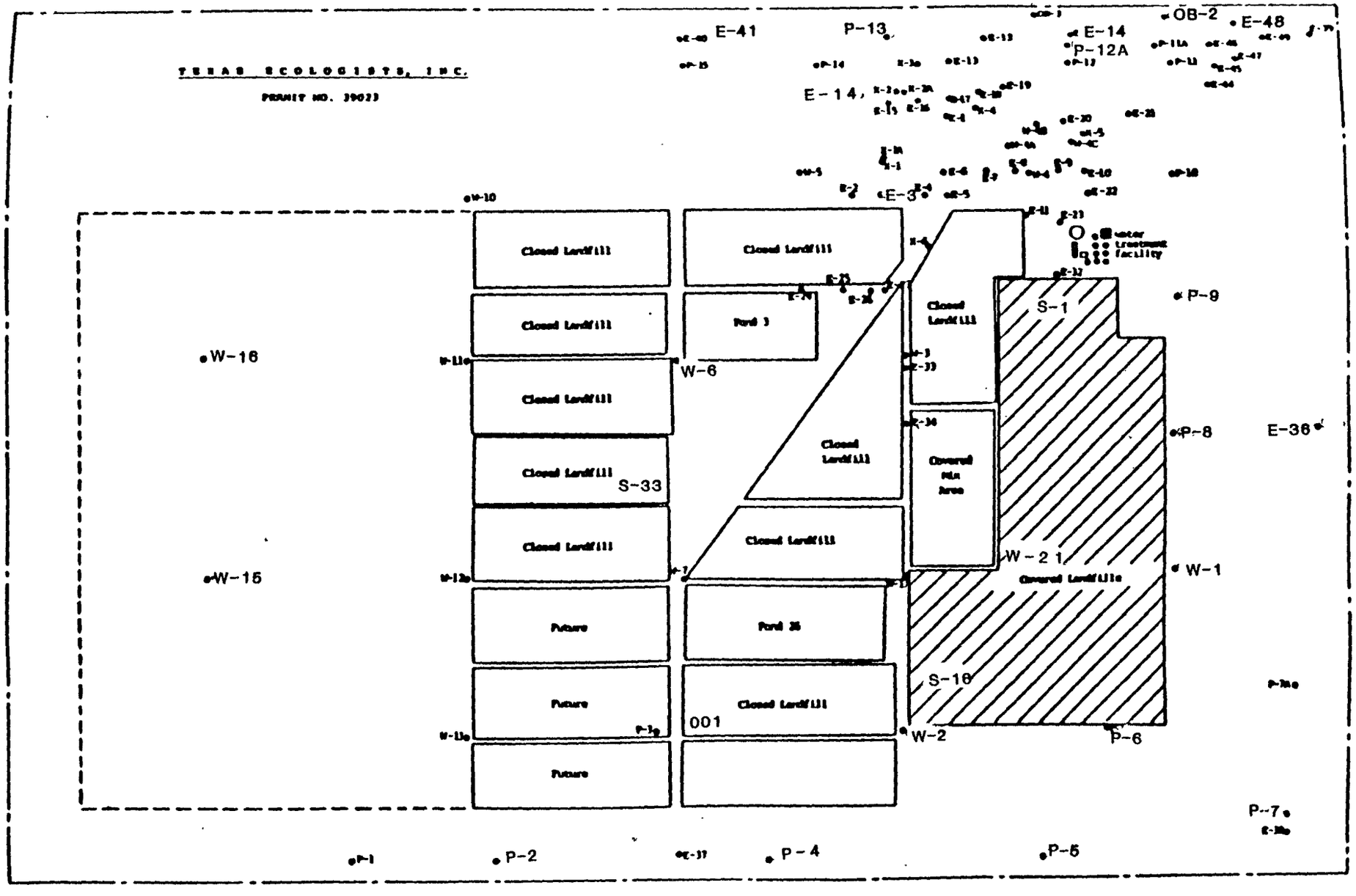


Figure C-8 Location of Task Force Sample Points

ATTACHMENT D

Analytical Techniques and Results for Task Force Samples
Texas Ecologists, Inc., Robstown, Texas

ATTACHMENT D

Analytical Techniques and Results for Task Force Samples
Texas Ecologists, Inc., Robstown, Tx

The following discusses analytical techniques, methods, and results for water and leachate samples collected by the Task Force at the Texas Ecologists, Inc. facility near Robstown, TX. Water sample analysis and results are discussed in the first section; the second section addresses the leachate analysis and results.

Field measurements on water samples, including conductance, pH and turbidity, were made by the EPA sampling contractor at the time of sampling. No field measurements were made on the leachate samples. Laboratory analyses results were obtained from two EPA Contractor Laboratories (CL) participating in the Contract Laboratory Program (CLP). One CL analyzed the samples for organic compounds while the other analyzed for metals and other parameters.

Standard quality control measures were taken including: (1) the analysis of field and laboratory blanks to allow distinction of possible contamination due to sample handling, (2) analyses of laboratory spiked samples and performance evaluation samples, and (3) analyses of laboratory duplicates and field triplicates to estimate precision. The performance evaluation samples were samples of known analytic concentrations prepared by the EPA Environmental Monitoring Systems Laboratory, Cincinnati, Ohio.

Table D-1 provides a summary by parameter, of the analytical techniques used and the reference methods for the sample analysis. The D-2 is a summary of field measurements collected, and Table D-3 provides a summary of concentrations for hazardous substances, indicator parameters, and metals found in GWTF samples collected at TECO.

Table D-1

Sample Preparation and Analysis Techniques and Methods

Parameter	Preparation Technique	Analysis Technique	Method Reference
Specific Organic Constituents			
Volatiles	Purge and trap	Gas Chromatography with Electron Capture Detection	CLP Method (a)
	Direct injection	Gas Chromatography - Mass Spectroscopy or	CLP Method
		Gas Chromatography with Flame Ionization Detection	CLP Method
Semi-volatiles	Methylene chloride extraction	Gas Chromatography - Mass Spectroscopy	CLP Method
Pesticides/PCB	Methylene chloride/hexane extraction	Gas Chromatography with Electron Capture Detection	CLP Method
Herbicides	Diethylether extraction/ methylation	Gas Chromatography with Electron Capture Detection	Method 8150 (b)
Elemntal Consistuents			
Mercury	Wet digestion for dissolved and total	Cold Vapor Atomic Absorption Sepctroscopy	CLP Method
As, Pb, Se and TI	Acid digestion for total	Furnance Atomic Absorption Spectroscopy	CLP Method
Other Elements	Acid digestion for total	Inductively Coupled Plasma Emission Spectroscopy	CLP Method
Field Measurements			
Conductance	None	Electrometric, Wheatstone Bridge	Method 120.1 (c)
pH	None	Potentiometry	Method 150.1 (c)
Turbidity	None	Nephelometric	No reference
Non-specific Organic Parameters			
POX	None	Purgable combusted, Microcoulometry	EPA 600/4-84-008
TOX	Carbon absorption	Carbon combusted, Microcoulometry	Method 9020 (b)
POC	None	Purgable combusted, Non-dispersive Infrared	No reference
NPOC	Acidify and purge	Liquid combusted, Non-dispersive Infrared	Method 415.1 (c)
General Constituents			
Ammonia	Particulates settled	Phenolate Colorimetry of supernatant	Method 350.1 (c)
Chloride	Particulated settled	Mercuric Precipitation Titration of supernatant	Method 9252 (b)
Nitrate	Particulates settled	Brucine Sulfate Colorimetry of supernatant	Method 9200 (b)
Sulfate	Particulates settled	Barium Sulfate Trubidimetry of supernatant	Method 9038 (b)
Cyanide	Manual distillation	Pyridine Barbituric Acid Colorimetry	CLP Method
Phenol	Manual distillation	Ferricyanide 4-Aminoantipyrine Colorimetry	Method 420.1 (c)

a) Contract Laboratory Program, IFB methods.
b) Test Methods for Evaluating Solid Wastes, SW-846.
c) Methods for Chemical Analysis of Water and Wastes, EPA-600/479-020.

TABLE D-2

Summary of Field Measurements
on Task Force Monitoring Well Samples

SAMPLE NUMBER	WELL LOCATION	TURBITITY NTU	TEMPERATURE °C	CONDUCTIVITY umhos	pH
461	W1	146	23	10,000	6.9
462	P8	49.0	24	24,000	7.0
464	P-7	152	20	800	8.0
465	P-4	29.5	26	1,700	8.0
466	P-2	22.7	28	6,000	7.2
467	001	118	15	15,000	7.3
469	P-5	7.18	28	18,000	7.5
470	W-15	1.72	20	12,000	6.8
471	W-16	6.8	21	2,400	7.7
472	W-2	15.36	20	2,300	7.0
473	W-21	61.8	12	1,000	6.6
474	E-3	40.7	11	12,000	6.1
475	W-6	1.45	19	70,000	7.0
477	P-9	14.0	15	19,000	7.1
478	E-48	6.25	19	8,000	7.3
479	P-13	11.4	16	12,000	7.1
480	P-12A	6.51	21	17,000	6.8
481	E-14	3.23	14	17,000	7.2
482	OB-2	36.0	18	6,000	7.5
484	E-14	12.3	19	6,000	7.7
485	E-36	44.1	12	4,100	7.6
486	P-6	125.7	17	3,200	7.2

Table D-3 Summary of Concentrations for Hazardous Substances List of Compounds, Indicator Parameters and Metals Found in Ground-Water Samples at TECO.

Parameters	EPA SAMPLE LOCATION (ppm)								
	W21	E3	W-6	P-9	E-48	P13	P12A	E14	OB2
Aluminum	8.460	5.110	ND	15.7	2.33	.773	1.50	.215	17.0
Antimony	.176	.132	ND	.196	ND	.186	.126	.104	.063
Arsenic	ND	.170	.017	.757	.0074	.099	.015	.076	.024
Barium	.102	.080	.151	.107	.066	.041	.075	.038	.472
Beryllium									
Cadmium	.007	.011	ND	.012	.016	.007	.006	ND	.008
Chromium	.035	.062	.016	.059	.020	.036	.034	.036	.029
Copper	ND	.093	ND	ND	.022	ND	ND	ND	.027
Iron	7.150	65.7	.155	8.590	2.33	.898	1.51	.308	10.6
Lead	.47	.300	ND	.293	.009	ND	.013	.105	.0083
Magnesium	279.000	377.	133.	483	66.7	264	278.	300.	62.90
Manganese	12.900	30.5	.054	.083	.086	.161	.036	.005	.259
Mercury	ND	.002	.0006	ND	ND	.0026	ND	ND	ND
Nickel	ND	.095	ND	ND	ND	ND	ND	ND	ND
Potassium	15.400	19.7	21.00	32.6	11.0	31.1	19.3	25.2	19.0
Selenium	.005	ND	.001	.006	ND	.001	.001	.002	ND
Sodium	6,450.	5340.	1550.	6830.	2800	5560	4490	6,090.	1910.
Thallium	.001	ND	ND.	.001	ND	.002	.002	.001	.120
Tin	.045	.142	.042	.042	.106	.122	.069	.099	.098
Zinc	.054	.128	.018	.079	.187	.040	.103	.053	ND
TOC	13	48.	2.40	6.000	4.400	4.000	1.90	1.10	1.80
TOX	17	28.5	1.73	1.580	.161	ND	.225	ND	ND
POC	17.	1.8	.890	.220	ND	ND	ND	ND	ND
POX	41	2.95	2.81	1.270	.020	ND	.125	.035	.028
Total Phenols	.096	.065	.028	ND	.038	.048	.018	.020	.036
Nitrate	2.320	ND	2.32	.540	2.100	1.940	1.740	1.32	1.160
Sulfate	2470.	ND	245	2340.	1,260.	1780.	1560	2040.	730
Chloride	9800.	ND	3220	11,900.	4,660.	6940.	6310	10,300.	3870.

(Continued)

Table D-3 Summary of Concentrations for Hazardous Substances List of Compounds, Indicator Parameters and Metals Found in Ground-Water Samples at TECO.

Parameters	EPA SAMPLE LOCATION (ppm)								
	W1	P8	P7	P4	P2	001	P5	W15	W16
Aluminum	3.3	7.87	85.6	5.8	3.48	1.12	1.03	.068	.255
Antimony	.154	.157	.156	ND	ND	.115	ND	.066	ND
Arsenic	ND	ND	.056	.0556	ND	.019	ND	ND	ND
Barium	.10	.070	.30	.031	.045	.06	.128	.040	0.174
Beryllium	ND	ND	.002	ND	ND	ND	ND	ND	ND
Cadmium	.004	.163	.008	ND	ND	.006	ND	.004	ND
Calcium	817.0	337.0	178.0	25.5	143.0	1040.0	79.3	777.0	94.0
Chromium	.03	.018	.070	ND	.013	.036	ND	.020	ND
Copper	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	2.23	4.42	57.1	3.07	2.03	.741	.63	.230	.141
Lead	ND	.017	.016	ND	ND	.015	ND	ND	ND
Magnesium	161.0	100.0	17.6	ND	23.1	153.0	10.8	118.0	21.6
Manganese	.256	.143	.433	4.74	.025	.023	.035	.007	ND
Mercury	.002	.0008	.001	.032	.0005	ND	.0005	ND	ND
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	22.0	16.7	17.9	3.15	10.8	24.4	6.2	22.6	12.2
Selenium	.003	.026	ND	.001	.001	.008	ND	.013	.005
Sodium	3120.0	3640	294.0	489.0	1870.0	4950	331.0	3200.0	677.0
Thallium	.001	.001	ND	ND	ND	.001	ND	ND	ND
Tin	.085	.058	.073	ND	ND	ND	ND	.051	ND
Zinc	.065	.036	.159	.018	.056	.017	ND	.026	.015
TOC	6.3	6.0	1.2	ND	1.6	ND	ND	2.3	2.1
TOX	.34	.98	.025	.026	.103	ND	.060	.049	.024
POC	ND	ND	ND	ND	ND	ND	ND	ND	ND
POX	.14	.898	ND	ND	ND	.029	ND	ND	ND
Total Phenols	.019	ND	.027	ND	ND	.022	.038	ND	.012
Nitrate	1.32	.440	2.1	1.36	2.2	1.14	.750	1.6	1.5
Sulfate	2960	2750	142.0	490.0	480.0	2.020	215.0	1160.0	104.0
Chloride	3110	2990	77.1	103.0	2000.0	7250	776.0	4670.0	930.0

(Continued) Table D-3 Summary of Concentrations for Hazardous Substances List of Compounds, Indicator Parameters and Metals Found in Ground-Water Samples at TECO.

Parameters	EPA SAMPLE LOCATION (ppm)					
	E41	E36	P6	W2	S33	S16
Aluminum	.257	2.290	5.65	ND	1.500	14.10
Antimony	ND	ND	.060	.190	ND	.778
Arsenic	ND	ND	.0112	ND	.866	5.470
Barium	.024	.091	.070	.034	ND	.265
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	.005	.004	ND	.005	.020	.085
Chromium	ND	.010	.016	.033	.325	7.650
Copper	ND	ND	.022	ND	.135	.100
Iron	.351	.005	4.30	.162	13.0	2090
Lead	.008	1.540	.006	ND	.0126	.005
Magnesium	62.0	28.3	15.7	316.	194.	605
Manganese	.011	.048	.056	.054	5.610	50.80
Mercury	ND	ND	.0002	ND	ND	.060
Nickel	ND	ND	ND	ND	.835	.255
Potassium	9.770	13.70	10.0	21.3	34.0	210
Selenium	ND	ND	ND	ND	.0375	.046
Sodium	1970.	1470.	880.	7150.	2150	13,400.
Thallium	ND	ND	ND	ND	ND	ND
Tin	.090	.106	.090	.104	.299	.720
Zinc	.31	.057	.081	.035	.120	.990
TOC	ND	ND	3.20	1.90	320.	22,000
TOX	ND	.162	3.83	1.90	27.2	1380.
POC	ND	.220	1.600	ND	14.0	580.
POX	ND	.017	7.630	.053	39.0	3.00
Total Phenols	.015	.038	.010	.010	9.8	2120.
Nitrate	.800	.320	1.240	1.40	ND	1.160
Sulfate	.820	650.	400.	2120.	1550.	2920.
Chloride	2510.	1950.	808.	11,200.	3540.	14,400.
Cyanide	ND	ND	ND	ND	.0425	.0875

(Continued)

Table D-3 Summary of Concentrations for Hazardous Substances List of Compounds, Indicator Parameters and Metals Found in Ground-Water Samples at TECO.

Parameters	EPA SAMPLE LOCATION (ppb)														
	W1	P8	001	W21	E3	W6	P9	E48	P13	P12A	E14	OB2	E41	P6	W2
Chloroform	9.4	32	20	1200	3500		300	30	5.0	100	38	33		310	48
Carbon tetrachloride	48						690			61					
Trichlorethene	84	340	7	2700	1000	300	450							5800	
1,1-Dichloroethene		15			160	3000									
1,2-Dichloroethane		400		490		210								400	
Tetrachloroethene		16	15	5800			220							3000	5.9
Trichlorofluoromethane		20		300		170								200	5.9
Methylene chloride				5000		100									
Acetone				900	290										
1,2-Dichloropropane				310											
Benzene				2100	240								6.0		
4-Methyl-2-pentanone				560	330										
Toluene				1400											
Chlorobenzene				3400											
Total Xylenes				340											
Phenol				37	58										
1,2-Dichlorobenzene				22											
N-Nitroso-dipropylamine				31											
1,1,1-Trichloroethane					180	1300									
1,1,2-Trichloroethane					180	1200									
2,4,5-T					550										
2-Methyl phenol					26										
4-Methyl phenol					98										
Dicamba					110									9	
Bis(2-ethylhexyl)phthalate													68		
Aroclor-1260														10	
Dichloroprop														34	

ATTACHMENT E

Examples of Monthly and Annual Ground water Recovery Report

T049-008-000-029

396.23

Texas Ecologists, Inc.

RECEIVED

March 15, 1982

Mr. Harvey Davis
Executive Director
Texas Department of Water Resources
Stephen F. Austin Building
1700 North Congress
Austin, Texas 78705

Dear Mr. Davis:

Attached is the February, 1982 Groundwater Recovery Report for Texas Ecologists, Inc.

Please note the absence of 'elevation water level' reading for well E-35. This is due to road construction around the well area. E-35 elevation water level reading will be included in the March report.

Should you have any questions, please do not hesitate to call.

Sincerely,

US ECOLOGY, INC.

David R. Fetter

David R. Fetter
Corporate Chemical Operations Officer

mj

Attachments

cc: Mr. Paul Kutchinski
Mr. Russell Lewis

Dist. 12

COPY TO DISTRICT 12
SENT 5/20/82 ck

RECEIVED
MAY 24 1982

T E C O Gro[illegible]ater Data

Dated: F[illegible]RUARY, 1982

ELL UMBER	Ph	C O D	T O C	T D S	C O N D	ELEVATION WATER LEVEL	O D O R	APPEARANCE
-1	7.57	63	2	15,500	21,900	34.25	No	Turbid
-2	7.40	42	1	9,160	14,200	34.61	Sewage	Turbid
-3	7.61	26	1	11,000	16,000	35.56	No	Turbid
-4	8.11	3	1	1,730	2,580	35.58	Chemical	Brownish
-5	7.40	30	4	8,990	12,800	36.88	No	Turbid
-6	7.44	32	8	5,290	8,210	37.53	Slightly Chem	Turbid
-7	7.80	2	1	1,100	1,780	40.99	No	Clear
-7A	7.96	3	1	599	979	41.65	No	Clear
-8	7.47	48	9	9,550	13,400	37.52	No	Silty
-9	7.10	96	4	29,300	37,300	38.81	No	Silty
-10	7.49	11	1	2,010	3,320	40.81	No	Turbid
-11	7.33	67	8	23,200	31,400	35.33	No	Clear to Turbid
-11A	7.37	65	6	25,200	34,900	34.72	No	Clear to Turbid
-12	7.36	101	23	20,200	27,800	35.45	No	Clear
-12A	7.25	49	6	22,800	30,400	34.73	No	Clear to Turbid
-13	7.34	20	6	25,300	34,500	34.76	No	Silty
-14	7.24	51	7	17,700	24,700	35.55	No	Turbid and Silty
-15	7.33	34	7	10,300	15,100	36.78	No	Turbid and Silty
-1	7.67	87	7	12,400	17,200	39.30	No	Slightly Turbid
-2	7.59	136	3	24,100	32,800	37.07	No	Slightly Turbid
-3	7.13	1,480	538	19,500	25,600	36.66	Chemical	Light Green
-4	6.60	9,180	3,780	22,100	26,100	Pump	Chemical	Light Brown
-4A	6.28	8,030	3,350	21,000	24,500	36.56	Chemical	Brownish
-4B	6.95	2,360	820	17,600	23,300	36.93	Chemical	Turbid
-4C	6.53	15,200	5,830	27,400	27,800	37.24	Chemical	Brownish

Total Gallons Recovered: 78,960

ATTACHMENT

E-3

T E C O Grou[illegible]ater Data

Dated: [illegible]

WELL NUMBER	Ph	C O D	T O C	T D S	C O N D	ELEVATION WATER LEVEL	O D O R	APPEARANCE
W-5	7.34	169	41	19,100	25,600	36.33	Slight Chem.	Yellowish
W-6	7.45	35	1	10,000	14,200	37.38	No	Clear
W-7	7.60	50	2	13,900	18,600	37.12	No	Clear
W-10	7.71	12	2	616	962	40.17	No	Slightly Turbid
W-11	7.67	3	2	615	928	39.83	No	Slightly Turbid
W-12	7.68	3	2	424	500	38.58	No	Slightly Trubid
W-13	7.70	8	4	365	490	35.05	No	Slightly Turbid
W-15	7.32	26	2	11,300	15,700	35.65	No	Clear
W-16	7.12	3	2	979	1,360	36.83	No	Clear
W-17	7.16	442	164	14,100	20,400	36.98	Slight Chem	Turbid
X-1A	7.83	2,520	752	16,400	21,300	Pump	Chemical	Turbid and Silty
X-2	6.77	579	183	20,900	28,000	35.08	Strong Chemical	Black
X-2A	6.72	568	189	20,500	26,700	Pump	Chemical	Light Amber
X-3	7.32	64	11	22,500	30,100	34.63	No	Silty and Turbid
X-4								
X-5	7.09	7,990	3,080	23,000	27,700	Pump	Sewage and Chem	Black
X-6	7.84	6,010	2,220	15,400	19,700	Pump	Chemical	Turbid Yellow
E-1	7.11	2,750	832	16,300	22,900	34.37	Strong Chem	Black and Silty
E-2	6.95	191	22	14,000	20,000	35.18	Chemical	Turbid and Black
E-3	6.92	964	292	18,500	25,300	35.28	Chemical	Turbid and Black
E-3A	6.87	1,480	528	15,600	20,800	35.43	Chemical	Tan Color
E-4	6.50	4,170	1,270	17,900	23,500	Pump	Chemical	Turbid
E-5	7.68	1,120	340	21,600	29,700	35.70	Turbid Black	
E-6	7.05	2,840	940	14,300	20,100	35.47	Chemical	Turbid Black

ATTACHMENT

E-4

T E C O Gro[illegible]water Data

Dated: 2

WELL NUMBER	Ph	C O D	T O C	T D S	C O N D	ELEVATION WATER LEVEL	O D O R	APPEARANCE
E-6A	6.83	3,250	1,110	14,900	20,400	Pump	Chemical	Turbid
E-7	7.14	1,590	450	8,980	13,00	Pump	Chemical	Black
E-8								
E-9	6.63	8,320	3,080	23,100	29,500	Pump	Chemical	Brown-Orange
E-10	7.36	432	170	7,420	11,800	Pump	Chemical	Turbid
E-11	6.85	1,180	418	10,400	19,400	36.73	Strong Chem	Turbid-Silty
E-12	7.42	49	4	13,300	18,300	33.45	No	Clear
E-13	7.27	106	25	22,500	30,200	33.62	Slight Chem	Clear
E-14	7.48	98	4	20,500	27,500	34.53	No	Clear
E-15	6.73	179	4	20,900	27,500	Pump	Chemical	Turbid
E-16	6.78	882	253	19,100	25,400	Pump	Chemical	Turbid (Slight)
E-17	6.88	497	146	19,800	26,300	Pump	Chemical	Turbid (Slight)
E-18	6.77	1,890	683	19,800	26,900	Pump	Chemical	Light Amber
E-19	7.08	291	94	20,200	26,800	Pump	Chemical	Turbid
E-20	6.73	9,020	3,600	23,800	27,900	Pump	Chemical	Black
E-21	6.98	2,040	751	18,800	25,500	36.82	Strong Chem	Black
E-22	7.09	167	57	9,630	14,300	38.53	Strong Chem	Clear
E-23	6.91	150	42	19,200	26,000	38.02	Slight Chem	Clear
E-24	7.31	7	3	4,730	7,240	36.55	No	Slightly Turbid
E-25	7.11	1,680	642	19,900	25,800	Pump	Slight Chem	Yellow
E-26	7.12	1,710	584	18,300	23,900	Pump	Slight Chem	Orange
E-27	6.80	1,500	536	17,200	22,800	Pump	Slight Chem	Yellow
E-28	7.05	5,370	1,990	15,000	20,000	Pump	Chemical	Turbid Yellow
E-29	7.02	3,890	1,390	11,700	16,100	Pump	Chemical	Dark Yellow
E-30	6.87	6,070	2,250	14,800	19,800	36.83	Chemical	Turbid
E-31	6.96	2,070	732	10,700	15,200	Pump	Chemical	Yellow

ATTACHMENT

E-5

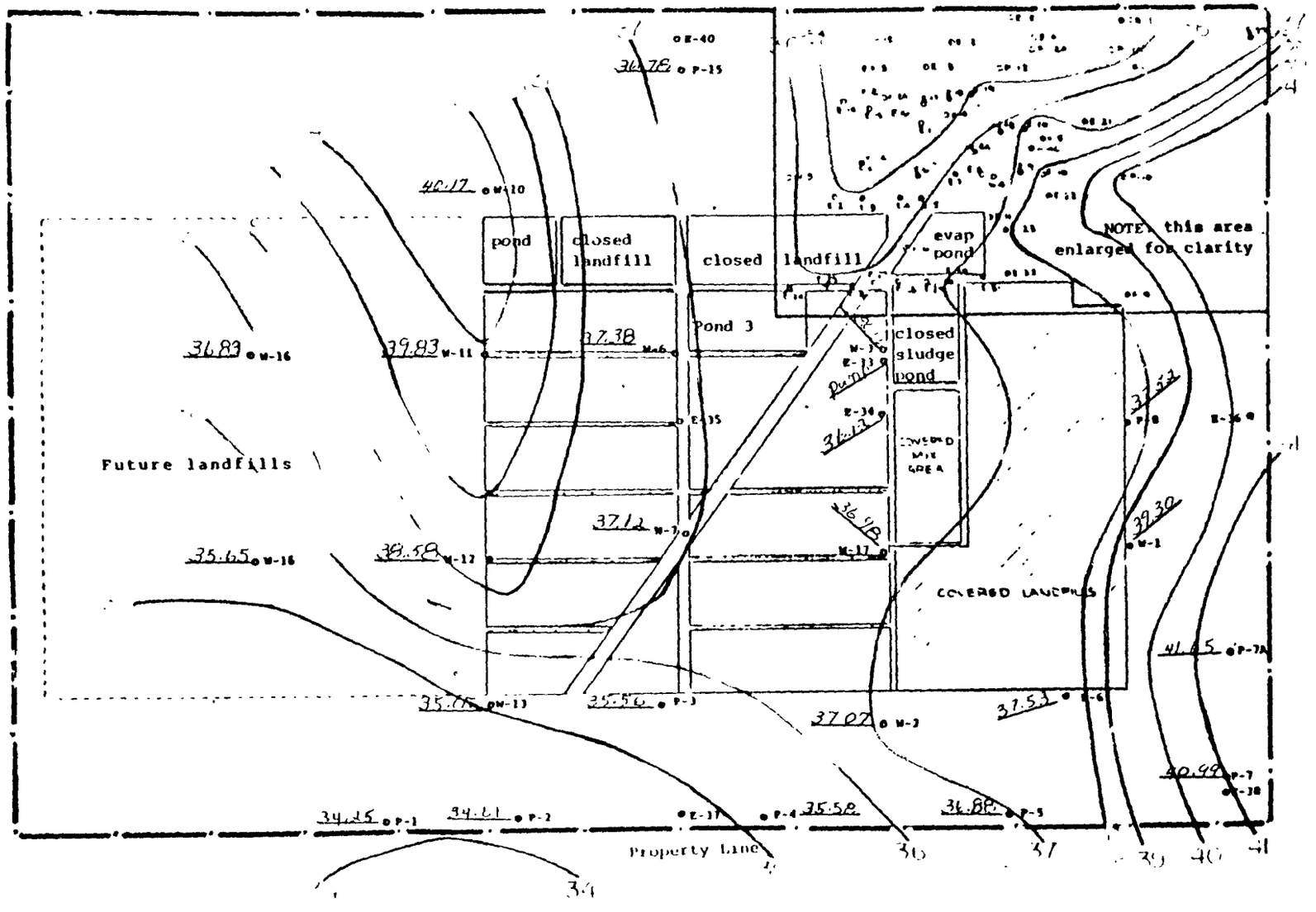
T E C O Gro[illegible]ater Data

Dated: 2

WELL NUMBER	Ph	C O D	T O C	T D S	C O N D	ELEVATION WATER LEVEL	O D O R	APPEARANCE
E-32	7.12	58	12	9,750	14,200	36.75	None	Turbid
E-33	7.17	8,140	1,880	18,500	24,700	Pump	Chemical	Turbid Yellow
E-34	7.11	319	94	11,400	16,700	36.12	Chemical	Light Yellow
E-35	7.65	38	2	8,840	12,300		No	Slight Turbid
E-36	9.69	21	4	4,140	6,610	32.48	No	Clear
E-37	10.1	53	4	12,100	17,900	33.08	No	Clear
E-38	7.81	92	3	13,000	17,900	32.55	No	Clear
E-39	7.87	8	1	3,610	5,950	32.33	No	Clear
E-40	10.9	45	3	4,720	7,780	32.83	No	Turbid
E-41	7.51	62	4	11,800	16,500	33.72	No	Clear
OB-2	7.36	27	4	15,500	21,200	32.78	No	Clear
OB-3	7.35	34	3	16,900	22,500	33.48	No	Clear, Silty

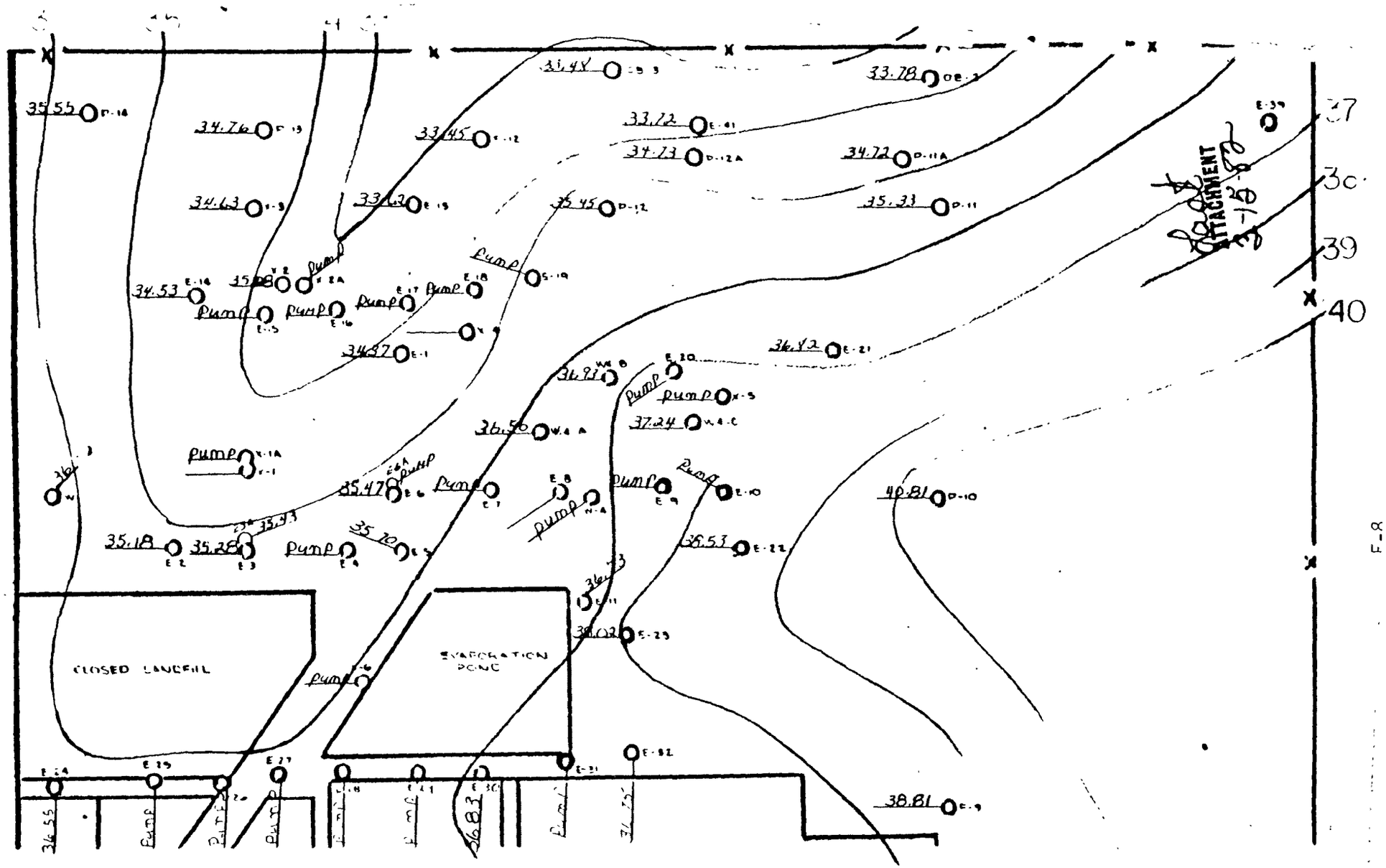
ATTACHMENT

PERMIT NO 39023



1982 February Potentiometric Map for TECO

ATTACHMEN



1982 February Potentiometric Map for TECO detailing the Northeast quadrant.

Texas Ecologists, Inc
P O Box 307
Robstown, Texas 78380
512-387-3518

Texas Ecologists
A Subsidiary of US Ecology Inc

Mr. Larry Soward
Texas Water Commission
1700 North Congress Avenue
Austin, Texas 78711

August 20, 1986

Dear Mr. Soward:

Enclosed is the July, 1986 Groundwater Recovery Report for Texas Ecologists, Inc.

The elevations on the attached contour map were taken over a two day period in order to get the most accurate elevation reading for the facility. Contours are also taken at time of sampling, and as a result may be slightly different then those shown on the contour map.

Should you have any questions, please contact this office.

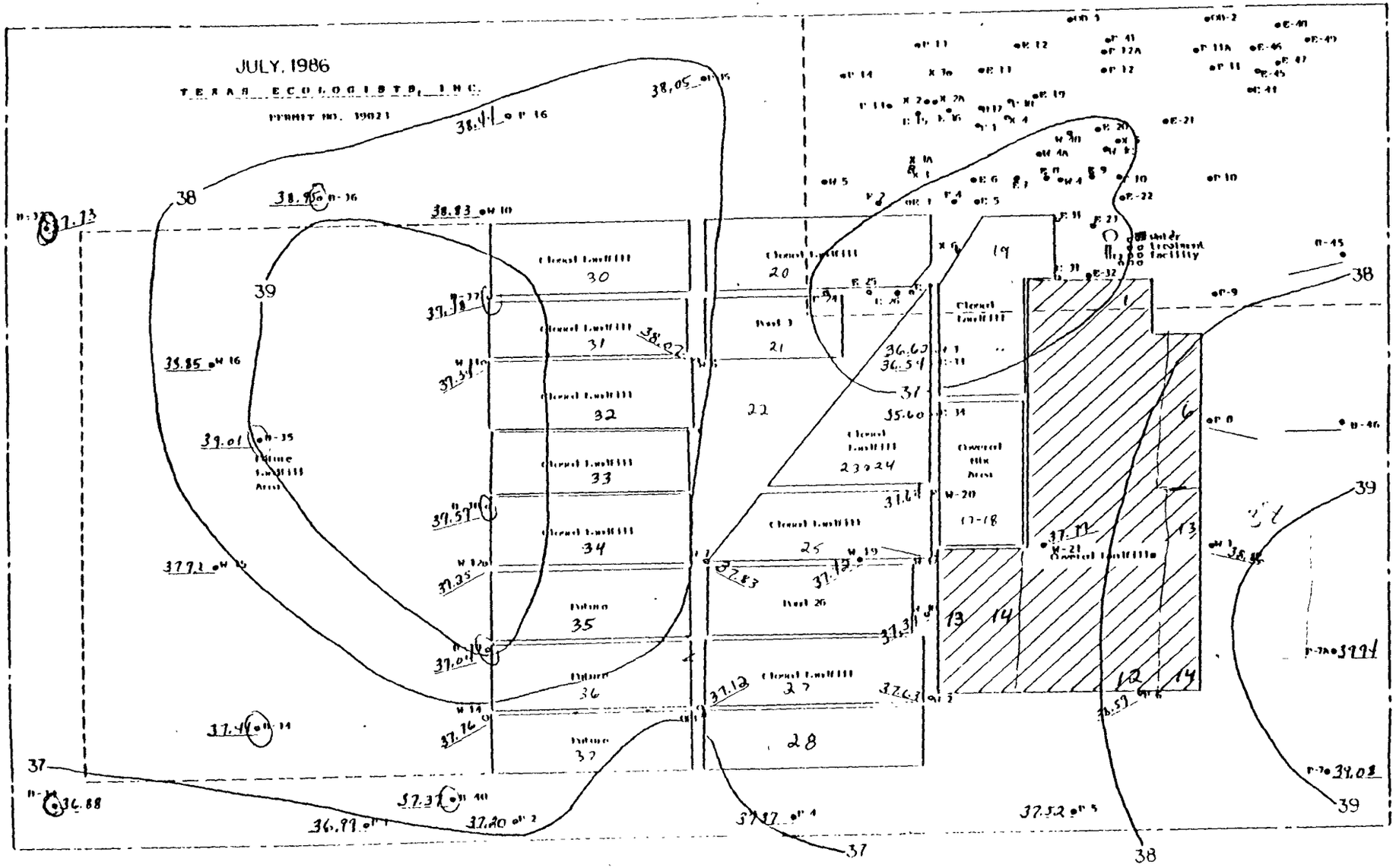
Sincerely,

Charles W. Mansfield
Chemical Operations Officer

CWM:lmj

cc: Messrs. Chip Volz
Paul Lewis

Enclosures


JULY, 1986
TERRA ECOLOGISTS, INC.
PERMIT NO. 19021
Closed Landfill
30
31
32
33
34
35
36
37
Future Landfill Area
20
21
22
23 & 24
25
26
27
28
19
17-18
13
14
12
Water treatment facility
38
39
37

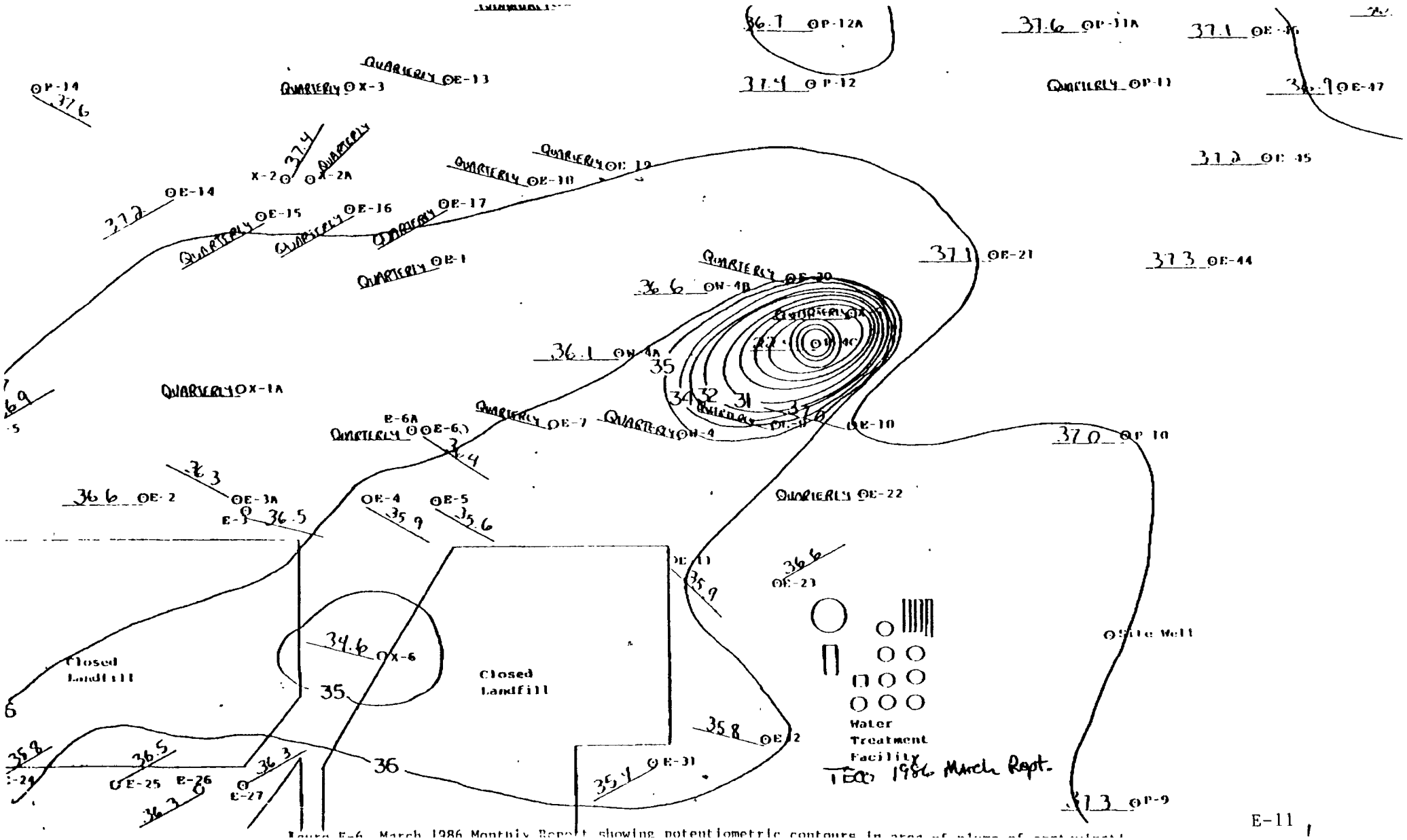


Figure E-6. March 1986 Monthly Report showing potentiometric contours in area of plume of contaminated