
**Hazardous Waste Ground-Water
Task Force**

**Evaluation of
Chemical Waste Management, Inc.
Vickery, Ohio**



United States Environmental Protection Agency



Ohio Environmental Protection Agency

MAY 1988

**UPDATE OF THE HAZARDOUS WASTE GROUNDWATER TASK FORCE
EVALUATION OF CHEMICAL WASTE MANAGEMENT, INC. - VICKERY**

The United States Environmental Protection Agency's (U.S. EPA) Hazardous Waste Groundwater Task Force ("Task Force"), in conjunction with the Ohio Environmental Protection Agency (OEPA), conducted an evaluation at the Chemical Waste Management, Inc. - Vickery (CWM-V) hazardous waste disposal facility. The Task Force effort is in response to recent concerns as to whether owners and operators of hazardous waste disposal facilities are complying with the Resource Conservation and Recovery Act (RCRA) groundwater monitoring regulations, and whether the groundwater monitoring systems in place at the facilities are capable of detecting contaminant releases from waste management units. CWM-V is located near Vickery, Ohio, approximately seventy-five miles west of Cleveland. The on-site field inspection began on April 6, 1987.

This update of the Task Force evaluation summarizes subsequent events that are directly related to hazardous waste groundwater monitoring issues.

The Task Force evaluation of CWM-V revealed several violations and deficiencies. The details of each violation and deficiency are explained in the text of the Task Force report. U.S. EPA sent a letter to CWM dated June 18, 1987, notifying them of the violations identified during the Task Force evaluation and informing CWM that the Vickery

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facility is unacceptable to receive waste from response actions taken under the Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA) in conjunction with the U.S. EPA Off-site Policy. CWM responded in a letter to U.S. EPA dated July 10, 1987, explaining that none of the violations cited in U.S. EPA's letter are justified. On August 27, 1987, U.S. EPA sent a letter to CWM stating that the Agency does not concur with CWM's conclusion that the violations are unjustified. In addition, the Agency reminded CWM of Paragraph O of the Consent Agreement and Final Order between U.S. EPA and CWM dated April 5, 1985, that subjects CWM to payment of stipulated penalties from the date of the violations. CWM responded to the Agency in a letter dated September 4, 1987, stating that they believe that the facility is in compliance with the Consent Agreement and Final Order and therefore, have no obligation to pay any stipulated penalty. U.S. EPA is currently considering the appropriate action concerning the observed violations.

Paragraphs H(11) and H(12) of the Consent Agreement and Final Order states that CWM shall submit the results of each semi-annual analyses and a report on the same to U.S. EPA and OEPA within thirty (30) days after receipt of all such final results. CWM submitted a report to U.S. EPA dated April 1988 entitled "Monitoring Well System, Analytical Data Evaluation, Vickery, Ohio Facility". This report is an evaluation of the chemical analysis results from CWM's monitoring wells sampled in April 1986, October 1976, April 1987, and October 1987. U.S. EPA is currently reviewing the report to determine its technical adequacy.

The construction of a disposal cell for the placement of wastes contained in the temporary waste pile and the placement of those wastes into the cell is described in Phase II of the Closure Plan for Surface Impoundments 4, 5, and 7. The Region V RCRA Permitting Branch issued an approval of the Phase II Closure Plan dated March 30, 1988. The approval letter also contained several conditions of approval with a staggered schedule for completions of each condition.

CWM is also required to receive a Toxic Substances Control Act (TSCA) Landfill Authorization from Region V prior to the placement of waste into the proposed disposal cell. Region V TSCA personnel are currently reviewing the proposal; consequently, a landfill authorization has not been issued to date.

CWM-V is required to submit a no-migration petition under RCRA, if it intends to inject wastes that are subject to the land disposal restrictions that apply to Underground Injection Control (UIC) wells. The regulations require owners/operators who desire to inject restricted wastes to submit a demonstration showing that:

(1) The hydrogeological and geochemical conditions at the site and the physiochemical nature of the waste streams(s) are such that reliable predictions can be made that:

(i) Fluid movement conditions are such that injected fluids will not migrate within 10,000 years:

(A) Vertically upward out of the injection zone; or

(B) Laterally within the injection zone to a point of discharge or interface with an underground source of drinking water (USDW); or

(ii) Before the injected fluids migrate out of the injection zone or to a point of discharge or interface with an

USDW, the wastes will no longer be hazardous because the hazardous constituents will have been attenuated or immobilized within the injection zone by hydrolysis, chemical interactions or other means.

CWM-V submitted a no-migration petition to U.S. EPA on April 29, 1988.

U.S. EPA is currently reviewing the petition.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
HAZARDOUS WASTE GROUND WATER TASK FORCE

GROUND WATER EVALUATION
CHEMICAL WASTE MANAGEMENT, INC.
VICKERY, OHIO
MAY 1988

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I. EXECUTIVE SUMMARY

A. Introduction

Operations at hazardous waste treatment, storage, and disposal (TSD) facilities are regulated under the Resource Conservation and Recovery Act of 1976 (RCRA), 42 U.S. 6901 et.seq. Implementing regulations which were issued on May 19, 1980 (40 CFR Part 260 through 265, as modified), established operating requirements for TSD facilities including the monitoring of ground water. The Administrator of the United States Environmental Protection Agency (USEPA) established a Hazardous Waste Ground Water Task Force (referred to hereafter as Task Force) to evaluate the level of compliance with ground water monitoring requirements at on-site and commercial off-site TSD facilities and to address the cause(s) of noncompliance. In addition the Task Force is to examine the suitability of the TSD facility to receive hazardous waste under the Comprehensive Environmental Response and Liability Act (CERCLA) or Superfund program.

The Task Force is comprised of personnel from USEPA headquarters, USEPA regional offices, and the state's environmental agencies. This evaluation is of the Chemical Waste Management, Inc., facility in Vickery, Ohio (CWM-V).

B. Objectives

The objectives of the Task Force evaluation at CWM-V are to: (1) determine compliance with the requirements of Ohio Administrative Code 3745-65-90 through 3745-65-94 and 40 CFR 265 Subpart F - Ground Water Monitoring, and the monitoring system's capability of providing the required data; (2) evaluate the facility's

ground water monitoring program as described in the RCRA Part B permit application for compliance with 40 CFR Part 270.14 (c); (3) evaluate the facility's potential compliance with 40 CFR Part 264 Subpart F; (4) verify the quality of the company's ground water monitoring data and evaluate the sampling and analytical procedures; (5) determine if any ground water contamination currently exists from site operations; (6) determine if the facility is meeting the requirements of the Superfund off-site policy; and (7) evaluate the interrelationships of the RCRA, TSCA, and UIC regulations at this facility.

C. Investigative Methods

To accomplish the objectives, a Facility Evaluation Team was assembled, comprised of a Management Team, a Technical (record) Review Team, a Laboratory Evaluation Team (to evaluate off-site contractor laboratories), and a Sample Collection Team. Each team had individual responsibilities to achieve the objectives of the Task Force.

The on-site facility inspection began on April 6, 1987, and was conducted by three teams: the Management Team, the Technical Review Team, and the Sampling Team. Off-site inspections were conducted at contract laboratories by the Laboratory Evaluation Team.

The Task Force contracted Planning Research Corporation (PRC) of Chicago, Illinois, to prepare a document package of pertinent background information from public information sources (i.e., USEPA, and OEPA files). The information collected by PRC concentrated on site events since about 1978 (e.g., inspection reports, hydrogeologic reports, and Part B application) and projected future activities. Information obtained from CWM-V during the evaluation was also

reviewed to supplement the information in the public files. By combining these information sources, the Technical Review Team was able to perform a complete evaluation of the facility with respect to ground water.

This evaluation considers only information available at the time of the investigation (April 1987) or before, unless specifically stated.

D. Task Force Findings & Recommendations

1. Waste Management Units

- The pond to the east of the hazardous waste pile on site contains hazardous waste and will require proper RCRA closure.
- Hazardous waste from the pond east of the hazardous waste pile is pumped into pond 12. Pond 12 does not have interim status or a RCRA permit.
- The effectiveness of the confining system for the injection wells has not been thoroughly addressed.
- The need for ground water monitoring of the injection wells should be thoroughly addressed and evaluated in detail by CWM-V.

2. Ground Water Monitoring System

- It is recommended that one bedrock well be installed near the location of L-30 to accommodate the change in ground water flow resulting in the operation of the truck wash well.
- It is recommended that initially a minimum of three lacustrine wells be installed on the east side of the waste pile retention basin to adequately monitor the surface impoundment.
- The new CAFO wells that have been installed appear to have been adequately constructed.
- A number of deficiencies have been noted in the Sampling and Analysis Plan of CWM-V. They are discussed in Section G.3. of the technical report. The most noteworthy deficiency is that CWM-V requires total organic carbon and extractable organic samples to be filtered. This is an inappropriate procedure which should be corrected immediately.

- The usability of CWM-V's existing data was evaluated by the Task Force and determined to be classified as:

Inorganic and Indicator Parameters - Qualitative

Volatile Organics - Quantitative

Semi-Volatile (extractable) Organics, PCBs, and Pesticides -

Qualitative, Biased Low

3. Ground Water Assessment

- Specific organics (e.g., methylene chloride, methanol, methyl ethyl ketone ...) have been found in the monitoring wells at CWM-V.
 - o The lacustrine zone on site is contaminated and a ground water assessment plan is needed.
 - o Bedrock background well MW-23RA is contaminated and should be relocated as a background well.
 - o Bedrock well P-10 shows contamination that needs to be addressed in a ground water assessment plan.
 - o The bedrock ground water monitoring system indicates periodic contamination. Further study is needed for this ground water zone.
- As of the date of the Task Force inspection, CWM-V has not conducted a ground water assessment nor submitted any ground water reports evaluating the rate and extent of migration of hazardous waste constituents identified during several ground water sampling events as required in 40 CFR 265.93 and the CAFO.
- CWM-V had not submitted ground water monitoring results for the April and October 1986 CAFO sampling to USEPA and OEPA within 30 days after receiving final results, as required in the CAFO.

E. RCRA Permit

The current application for a RCRA permit does not include a ground water monitoring program because CWM-V is seeking a permit for storage and treatment tanks and the UIC wells; these activities do not require ground water monitoring under RCRA. The hazardous waste impoundments are being closed under the authority of 40 CFR 265 (interim status). The USEPA has not requested that CWM-V provide the ground water monitoring information for the post-closure care

portion of the permit. Based on the current ground water monitoring information, a compliance monitoring program under 40 CFR 264.99 should be provided in the permit application.

F. Compliance with Superfund Offsite Policy

Under current USEPA policy, if an offsite TSD facility is to be used for land disposal of waste from a Superfund financed cleanup of a CERCLA site, the TSD facility must be in compliance with the applicable technical requirements of RCRA. As of June 18, 1987, CWM-V has been declared ineligible to receive waste from response actions taken under CERCLA. Region V made this determination based upon violations found during the Task Force inspection.

II. TECHNICAL REPORT

A. Introduction

Operations at hazardous waste treatment, storage, and disposal (TSD) facilities are regulated by the Resource Conservation and Recovery Act (RCRA) (42 U.S.C. 6901 et.seq.). Implementing regulations issued pursuant to RCRA (40 CFR Parts 260 through 265, as modified) address waste site operations including monitoring of ground water to ensure that hazardous waste and hazardous waste contaminants do not escape undetected into the environment.

The Administrator of the United States Environmental Protection Agency (USEPA) established a Hazardous Waste Ground Water Task Force (referred to hereafter as Task Force) to evaluate the levels of compliance with ground water requirements at on-site and commercial off-site TSD facilities and to address the cause of noncompliance. In addition the Task Force is to examine the suitability of the facility as a provider of treatment, storage, or disposal services for waste managed by the USEPA's Superfund program. The Task Force is comprised of personnel from USEPA headquarters, regional offices, and the states. Fifty-nine TSD facilities have had a Task Force ground water evaluation; one of these is the Chemical Waste Management, Inc., facility in Vickery, Ohio (CWM-V).

B. Objectives

The objectives of the Task Force evaluation at CWM-V were to:

- o Determine compliance with requirements of 40 CFR Part 265, Subpart F (Ohio Administrative Code 3745-65) ground water monitoring, 40 CFR Part 761 (TSCA ground water monitoring requirements for future waste cell), and 40 CFR Parts 144-148 (underground injection control (UIC) requirements).

- o Evaluate the facility's potential compliance with 40 CFR Part 264, Subpart F (OAC 3745-55).
- o Verify the quality of the company's ground water monitoring data and evaluate sampling and analytical procedures.
- o Determine if any ground water contamination currently exists.
- o Determine if this site meets the requirements of the CERCLA (Superfund) off-site policy.

C. Investigative Methods

The Task Force investigation at CWM-V consisted of:

- o Reviewing and evaluating records and documents from USEPA-Region V files, Ohio EPA files, and provided by CWM-V during the on-site inspection.
- o Conducting an on-site inspection from April 6 through 16, 1987.
- o Evaluating the off-site laboratory utilized by CWM-V for analysis of past and present ground water samples.
- o Sampling and analysis of ground water from monitoring wells at CWM-V.
- o Sampling and analysis of surface water and leachate found at CWM-V.

To accomplish the objectives, a Facility Evaluation Team was assembled, comprised of a Technical Review Team, a Laboratory Evaluation Team and a Sample Collection Team. Each team had individual responsibilities which when combined will achieve the objectives of the Task Force.

1. Technical Review Team

The Technical Review Team was responsible for conducting the evaluation of the facility with respect to applicable ground water monitoring regulations. The team's objective was to determine compliance with 40 CFR Part 265, Subpart F; 40 CFR 270.14(c); 40 CFR Parts 144-148; and potential compliance with 40 CFR 761 (TSCA); and 40 CFR Part 264, Subpart F. The evaluation focused on the following six areas:

1. waste characterization and operations;
2. site history and design;
3. site geology and hydrogeology;
4. ground water monitoring system adequacy;
5. ground water sampling and analysis procedures; and
6. ground water quality data and interpretation.

The Task Force core team in Washington, D.C., contracted Planning Research Corporation (PRC) of Chicago, Illinois, to prepare a document package of pertinent background information. The information collected by PRC primarily concentrated on past inspections and submittals (e.g., inspection reports, hydrogeologic reports, TSCA land disposal application, and the Part B application) from regional and state files. Information obtained from CWM-V during the Task Force evaluation was also reviewed to supplement the accuracy of the information in the public files. Combining these information sources, the technical review team performed a complete evaluation of the facility records with respect to the ground water monitoring system.

During the investigation the team met with facility representatives and legal counsel at least twice a day to request information. Typically, information requested by the Task Force in one meeting was supplied by CWM-V in a subsequent meeting by referencing specific sections of past reports. CWM-V did not permit the Task Force to directly question any of its consultants. The team also toured the site to evaluate and verify the waste units and handling at the facility.

2. Laboratory Evaluation Team

The off-site laboratory that analyzes samples for CWM-V was evaluated by the USEPA Region V, Quality Assurance Office. The laboratory evaluated was Environmental Testing and Certification Corporation (ETC) of Edison, New Jersey.

3. Sample Collection Team

Samples and field measurements for the Task Force evaluation at CWM-V were collected by Alliance Technologies Corporation (referred to as Alliance hereafter), a USEPA contractor, under the supervision of USEPA personnel.

D. Waste Management Units

1. Introduction

CWM-V operates a liquid treatment and disposal facility in Sandusky County, Ohio, approximately two miles north of Clyde along State Route 510 (see Figure 1, all figures and tables can be found after page 55 at the back of this report). At the time of the Task Force inspection, wastes were disposed by deep-well injection into the five operational wells located on the 437-acre facility. Only liquid wastes stored or generated on site were being injected. No off-site wastes were accepted at that time.

This site, originally known as Don's Waste Oil, was first used in 1958 to recycle waste oil collected from service stations. In 1961, the company began to accept various industrial wastes, such as cutting oils, hydraulic fluids, and some solvents. These materials were stored in containment ponds. In 1964, the Ohio Water Pollution Control Board (predecessor to the Ohio Environmental Protection Agency) granted the facility permission to accept chemical process wastes such as pickle liquors from metal-working operations, lime sludge, and

other miscellaneous chemical products. More ponds were constructed to facilitate the growing inventory of liquid wastes, and by the late 1960's, the amount of industrial wastes received by the facility exceeded that of waste oil.

In 1971, the firm was incorporated as Ohio Liquid Disposal, Inc. Faced with growing volumes of waste, the company began investigating a suitable means of disposal. In 1972, permission was granted by the Ohio Division of Oil and Gas to drill a test hole to evaluate subsurface conditions for a possible injection well. An application was submitted for permission to use this well for injection of industrial waste. In September of 1972, the Water Pollution Control Board refused approval for a permit. In this same month, the Division of Oil and Gas refused to issue a permit to convert the well for waste disposal. These decisions were appealed through the state judicial system, and in May of 1975, the State Court of Appeals in Toledo, Ohio, ruled that the permit be issued. In July of 1975, a permit to use well No. 1 as a waste disposal well was issued by the Division of Oil and Gas.²² Injection into this well began in June 1976. In January 1976, permits were issued for the installation of wells Nos. 2, 3, and 4 (see Figure 19). Well No. 2 was completed in November 1976 and injection began in March 1977. Wells Nos. 3 and 4 were both completed in November 1976, with injection beginning in August 1977. Due to corrosion of the long string casing in well No. 1, it was not used for injection after July 1979 and was eventually plugged and capped. To replace well No. 1, well No. 1A was drilled and completed in October 1979. Injection into this well began in January 1980. Wells No. 5 and 6 were completed in December 1980 and May 1981, respectively. Injection of waste into both of these wells began in September 1981. In May of 1986 well No. 3 was also found to have corrosion problems;

operation of well No. 3 ceased at that time. It was plugged in July of 1987. Well 1A was taken out of service in the fall of 1987; thus only four wells (2, 4, 5, and 6) are presently being used for injection.

CWM-V had, at one time, 12 unlined ponds (Nos. 1-12) in which liquid wastes were settled and stored prior to filtration and injection. At this writing (May 1988) all but five ponds (Nos. 4, 5, 7, 11, and 12) have been filled and covered. Ponds Nos. 4, 5, and 7 (see Figure 2) have been drained, and the contaminated bottom sludge has been solidified and is currently being stored in a stockpile to the east of pond No. 4. This stockpiled material is to be replaced in a cell located at the former site of ponds Nos. 4, 5, and 7 once an appropriate liner and leachate collection system are installed and a closure plan is approved; this will create a disposal cell on site. Ponds 11 and 12 are partially drained and once completely emptied, the contaminated bottom sludge is also to be disposed in the above-mentioned cell. At the time of the inspection, construction of the disposal cell was suspended. Both the USEPA TSCA and RCRA programs were in the process of reviewing its design and adequacy.

A summary of regulatory history for CWM-V, starting in 1979, can be found in Appendix A of this report. This summary deals mainly with the RCRA and TSCA compliance history of the facility.

2. Surface Impoundments

CWM-V has stated that the surface impoundments were constructed by excavating the clay down to the proposed bottom elevation of each impoundment and using the excavated clay to construct the containment dikes around the impoundments. No linings were placed in any of the impoundments. The dikes range in elevation from 10 to 20 feet above the original ground surface.³¹

a. Surface Impoundments That Have Been Filled and Capped³¹

Pond No. 1 (see Figure 2) was opened in 1961 and filled in 1980. When emptied its sludge was removed and placed in Pond No. 4. Pond No. 1 was approximately 430 feet x 90 feet x 12 feet deep. CWM-V stated that it was filled with demolition debris and capped with clean fill.

Pond No. 2 was opened in 1962 and filled in 1979. When emptied the sludge was fixed with foundry sand and lime kiln flue dust. CWM-V stated that the fixed sludge was then left in place and covered with demolition debris and capped with clean fill. Pond No. 2 was approximately 320 feet x 100 feet x 12 feet deep.

Pond No. 3 was opened in 1962 and filled in 1977. CWM-V stated that the sludge was removed from this pond and landfarmed on site (see Figure 2). It was then capped with clean fill. The pond was approximately 230 feet x 150 feet x 6 feet deep.

Pond No. 6 was opened in 1966 and was split into an east and west pond in 1976. Pond No. 6-East was filled in 1979 and the sludge was removed and placed in Pond No. 4. CWM-V stated that clean fill was used to cap it. It was approximately 125 feet x 75 feet x 12 feet deep. Pond No. 6-West was filled in 1981; CWM-V stated that some of the sludge was landfarmed (in 1978/1979) and some was fixed with foundry sand and lime kiln flue dust (in 1981). CWM-V stated that this mixture was left in the pond and capped with clean fill. Pond No. 6-West was approximately 200 feet x 75 feet x 15 feet deep.

Pond No. 9 was opened in 1969 and filled in 1981. CWM-V stated that it was filled and capped with clean fill. It is uncertain whether the sludge from Pond No. 9 was removed or solidified and left in place. Pond No. 9 was approximately 440 feet x 75 feet x 11 feet deep.

Pond No. 10 was opened in 1971 and filled in 1982; CWM-V stated that sludge removed from this pond was placed in Pond No. 4. Clean soil was used to fill and cap it. Pond No. 10 was approximately 520 feet x 150 feet x 12 feet deep.

The closure requirements of RCRA are applicable to Ponds Nos. 1, 4, 5, 6, 7, 9, 10, 11, and 12. Closure plans have not been submitted for Ponds Nos. 1, 6, 9, and 10 as of this writing.

b. Surface Impoundments Awaiting Closure

At the time of this investigation, ponds No. 4, 5, and 7 had been drained and the sludges solidified and placed in a temporary waste pile to the east of Pond No. 4. The area that included Ponds No. 4, 5, and 7 is presently in the process of being constructed into a RCRA/TSCA disposal cell. When final approval is obtained from both the USEPA RCRA and TSCA programs, the waste from the temporary waste pile will be placed in the new cell. It should be noted that Pond No. 7 includes the old Pond No. 8.

Ponds No. 11 and 12 are still open but not receiving waste from off site, except that Pond No. 12 accepts hazardous waste as stated below. They are planned to be closed with their solidified sludges being put into the above-mentioned disposal cell.

There is presently a pond to the east of the above-mentioned waste pile which collects runoff and leachate from the waste pile. The waste pile contains

hazardous waste; therefore, leachate from it is also considered to be hazardous waste under 40 CFR 261.3(c)(2) and will require proper RCRA closure. Also, the Task Force analysis found that this pond contains hazardous waste constituents (see Section J.2.d.4). The hazardous waste from this pond is pumped to Pond No. 12 before being deep-well injected.

3. Abandoned Oil Recovery Facility and Sludge Farm²

The oil recovery facility on the eastern side of the site was used to recover No. 5 fuel oil for resale from used machinery oils, hydraulic oils, water soluble oils, motor oils, rolling mill stock oils, etc. This facility was decommissioned during the summer of 1986.

Oily sludges were landfarmed into the soil for a biological degradation experiment in the sludge farm area north of Ponds No. 11 and 12 in 1978. The project was not successful and was abandoned after two months. The soil and oily sludge were excavated and transferred to the waste ponds.

4. Injection Wells

a. Background

Class I injection wells as defined in 40 CFR 146.6 (a)(1) are wells used by generators of hazardous waste or owners or operators of hazardous waste management facilities to inject hazardous waste beneath the lowermost formation containing, within one-quarter mile of the well bore, an underground source of drinking water (USDW), and (2) other industrial and municipal disposal wells which inject fluids beneath the lowermost formation containing, within one-quarter mile of the well bore, an USDW. These wells are regulated by the Ohio Environmental Protection Agency (OEPA) Underground Injection Control (UIC) program pursuant to Chapter 3745-34 of the Ohio Administrative Code (OAC).

OEPA was granted authority to administer the UIC program (40 CFR Parts 144-148) by the USEPA Region V Water Division. USEPA retains authority for UIC provisions under the Hazardous and Solid Waste Amendments of 1984 (HSWA).

b. Site Stratigraphy

All injection wells were completed with an open hole construction into the Mt. Simon Formation (the injection zone). Located at a depth of approximately 2800 feet below the ground surface, the Mt. Simon Formation is composed of fine to coarse grained sandstone that averages in thickness between 84 and 139 feet. The injection zone is overlain by a confining system which is comprised of four individual formations which occur between 2366 and 2808 feet. The formation which is located immediately above the injection zone is the basal dolomite of the Rome Formation which is composed of thin interbedded, moderately permeable (1-1500 md) dolomites and sandstones and thicker layers of lower permeable (<0.01 md) dolomites.¹ The Mt. Simon Formation is overlain, in ascending order, by the Rome Sandstone and Dolomite Formation; the Conasauga Formation; the Kerbel Formation, which is composed of interbedded dolomitic sandstone, shaley sandstone and sandstone; and the Copper Ridge (Knox) Dolomite. The Mt. Simon Formation and its confining system is further separated from the lowermost fresh water aquifer (the Big Lime) by approximately 1700 feet of sedimentary strata (Figure 3).

c. Operation

Injection well No. 1 was drilled in 1972 and began operation in 1976. Four years later this well was plugged and abandoned due to a hole in the casing caused by corrosion. Subsequently, six additional packerless wells were constructed during 1976 to 1980. Numerous reworks were conducted on the wells

at CWM-V in an attempt to correct recurring mechanical well failures which allowed acid waste to enter formations above the Mt. Simon Formation.²² Finally, in 1983 to 1985, all wells were reworked and recompleted with packers and corrosion resistant casing and cement.

The replacement of injection well materials with corrosion resistant casing and cement was a necessary precaution given that the injectant is a very acidic (pH <1.0) waste pickling liquid used for steel processing. Injection of this waste into noncorrosion resistant wells probably facilitated mechanical failures.

d. Mechanical Integrity Tests

As a result of these prior releases both USEPA and OEPA imposed annual mechanical integrity test (MIT) requirements on CWM-V. These MITs are used to test: (1) the integrity of the casing, tubing and packer and (2) to demonstrate the absence of upward fluid migration adjacent to the well bore. Part 1 of the MIT is accomplished by performing a pressure test with a liquid. A predetermined pressure is applied to the entire annulus (Figure 4); in the meantime, the tubing is either injecting or shut-in. In order for the injection well to pass this test, the annular pressure must remain constant ($\pm 3\%$ for error or surface piping leaks) for one hour. If the pressure increases or decreases it indicates that the integrity of the well is in question.

Part 2 of the MIT uses geophysical logging methods, in this case a radioactive tracer (RAT), to detect casing leaks and/or fluid movement behind the casing. If none of the tracer is detected escaping from the casing or moving up behind the casing into unpermitted zones, then the well passes.

In May 1986 injection wells No. 1A through 6 (except No. 3, which has been plugged) were tested for mechanical integrity. All of the tested wells passed Part 1 and all but well No. 2 passed Part 2 of the MIT. Well No. 2 was suspected of having a channel adjacent to the well bore at the base of the well, but it passed the MIT in 1987 as noted below.

Subsequent MITs performed on injection wells No. 1A, 2, 4, 5, and 6 in the fall of 1987 passed four of the five wells (see Figure 19). Well No. 1A failed and was taken out of service and is plugged and abandoned.

e. Discussion

In the past ten years of underground injection at CWM-V a number of operational problems have occurred at the facility. Initial injection well construction and configuration did not provide adequate protection against the acid waste, resulting in numerous well failures/leaks, some of which went unreported by CWM-V for an extended period of time. At the time of the Task Force review, these releases were still not completely defined by CWM-V, and even though the facility's UIC consultants were on site during this investigation, CWM-V did not permit the Task Force to question these consultants on this or any other issue. The causes of these releases were addressed in a Consent Decree with OEPA which required CWM-V to rework all wells and install an annular seal system. CWM-V performed this task between 1983 and 1985.

The effectiveness of the confining unit in containing the injected waste is of concern to the Task Force. The clustering of the injection wells on the CWM-V site results in significant pressure increases in the Mt. Simon Formation when the wells are in operation. According to CWM-V, this pressure increase dissipates with time once injection has ceased. The concern is how this pressure

increase affects the initial confining layer which is the basal dolomite of the Rome Formation. The basal dolomite of the Rome Formation is composed of interbedded, moderately permeable and lower permeable dolomites. Laboratory compatibility tests, performed by CWM-V, on the dolomite and the acid waste suggest that, although the dolomite is fairly permeable to natural Mt. Simon brines, the waste acid reacts with the dolomite causing a reduction in permeability. Given the pressure buildup and potential reduction in confining layer permeability of the dolomite, an estimate of upward penetration of brine or waste was made by CWM-V. It was estimated that it would take brine or acid waste 20 years to migrate through the dolomite and into the overlying sandstone of the Rome Formation.^{1,22} Once it reaches the sandstone it is suggested that the sandstone would dissipate the energy laterally within the permeable sandstones, which would lower the potential for vertical migration from that point.

The Task Force found that the effectiveness of the immediate confining unit has not been thoroughly demonstrated by CWM-V and that the ability of the immediate confining unit to contain the waste remains questionable. The Task Force suggests deep well monitoring of the Rome Formation could provide the ability to detect migration of waste from the injection zone, if any migration should occur.

CWM-V will be required to submit a no-migration petition under RCRA, if it intends to inject wastes that are subject to the land disposal restrictions that apply to UIC wells. The subject petition must demonstrate that the disposal of hazardous wastes by deep well injection at the facility is done in such a way as to be protective of human health and the environment and that the waste will not migrate from the injection zone for 10,000 years or as long as the wastes remain hazardous.

After a thorough review of the petition, a site-specific requirement of ambient monitoring (deep well) could be initiated to enhance confidence in CWM-V's petition demonstration of no-migration. The actual implementation and parameters thereof cannot be evaluated at the time of this report. The Task Force recommends that the ambient monitoring question be thoroughly addressed and evaluated in detail during the Land Ban Petition evaluation process to be completed by USEPA Region V. The Task Force believes that recent and future data acquisition and modeling will provide insight into this concern.

E. General Geology

1. Previous Investigation

The first significant hydrogeologic investigation for the facility was conducted by Bowser-Morner Laboratories, Inc., and is described in a report dated May 1983.² A hydrogeologic investigation and statistical analyses of ground water quality data were performed. Thirty-two (32) borings were made and five (5) piezometers were installed during the study. The boring program focused on describing the glacial overburden. A pump test of the bedrock was conducted to determine aquifer characteristics. The overall flow system described in this report is generally consistent with subsequent reports. Bowser-Morner was first to identify the inward flow pattern at the site caused by pumping in the water supply wells (e.g., truck wash well).

The majority of site-specific studies that followed the Bowser-Morner report were conducted by Golder and Associates, who reevaluated the hydrogeologic system based upon additional data and focused on specific issues concerning the hydrogeologic or monitoring systems. A listing of site-specific hydrogeologic studies is included in the reference section at the end of this

report. A more comprehensive list of references (including off-site studies in the area of the site) is given in the Golder and Associates report dated July 1986.¹⁹

Figure 5 shows locations of borings, wells and piezometers installed at the facility as of May 1986.¹⁹ The Task Force is not aware of any hydrogeologic studies conducted between July 1986 and the Task Force inspection in April 1987.

2. Glacial Overburden

The facility is underlain by 33 to 52 feet of glacial overburden. The overburden is comprised of glacial lacustrine deposits overlying two till units. The glacial overburden overlies a predominantly dolomite bedrock. A 500 to 550 foot thick sequence of Devonian and Silurian age dolomite deposits are found under the glacial overburden. Figure 6 depicts the glacial overburden at the site in cross-sectional view. The figure shows that the contacts are generally horizontal and that the ponds that contain hazardous waste are about 30 to 40 feet above the bedrock.

The uppermost deposit is comprised of lacustrine materials. This deposit is thought to have been deposited in a pro-glacial lake. The deposit is described as having horizontal laminations of silty clay with occasional fine sand between the laminations. In the area around the facility, this deposit ranges from 0 to 25 feet in thickness.¹⁹ The most recent boring program for the facility revealed that the lacustrine material is generally absent south of State Route 412 and is up to 16.7 feet thick at monitoring well L-34 (Figure 16).

Glacial till underlies the lacustrine deposit. The till is divided into an upper unit that is continuous across the site and a lower unit that is discontinuous. The upper till unit ranges from 11 to 38 feet in thickness while the lower till unit is less than 13 feet thick. The upper till unit generally consists of silty clay to clayey silt with some sand and gravel, and is relatively homogeneous with no distinct depositional structures (e.g., bedding or laminations). The lower till unit is comprised of silt with some clay, sand and gravel. The lower till is more dense and more coarsely graded than the upper till unit.

Some fine sand and/or silt deposits have been encountered in the glacial tills. Material that can be classified as predominantly sand was found in four borings over a total interval of 5.7 feet. The specific locations of these sand lenses are as follows:

<u>Boring Number</u>	<u>Depth of Lenses From - To (ft.)</u>	<u>Material Description</u>
SS-13	27.5 - 31.2	Fine coarse SAND, little fine to coarse gravel (SP)
SL-1	20.4 - 21.3	Fine to coarse SAND and SILTY CLAY (SC)
G-14	19.6 - 20.4	Fine to coarse SAND and CLAYEY SILT (SM)
G-27	29.3 - 29.6	Fine to coarse SAND, some fine gravel, trace silt (SP)

This information is taken from Reference 6. The sand lenses discovered in borings G-14 and G-27 are monitored by wells T-14 and T-27, respectively, which are screened over these intervals. Borings SS-13 and SL-1 were located next to one another along the east side of old Pond No. 4 (now the new disposal cell). A till monitoring well is not present or proposed in this area.

The upper 5 to 10 feet of glacial overburden has been desiccated (i.e., dried out). Desiccation cracks are common in the upper portions of the uppermost deposits. Below the limit of desiccation the lacustrine and upper till deposits are usually soft with relatively high moisture contents and are nearly normally consolidated. The lower till appeared more consolidated than the upper till based upon descriptions of this deposit. Observation of some cores present at the facility and comparison to their logs verifies the descriptions of the deposits given in the reports at the facility.

3. Bedrock

The Tymochtee Dolomite, middle member of the Bass Island Formation, is immediately under the glacial tills. It is approximately 150 feet thick under the site. The Tymochtee is underlain by the Greenfield Dolomite (also Bass Island Formation). Underneath the Bass Island Formation is the Lockport Formation. Although not differentiated on Figure 3, these formations are part of the "Big Lime." The Big Lime is an informal driller's name for this geologic sequence.

The Tymochtee Dolomite is generally described as thin bedded, gray-brown, very fine grained dolomite with solution zones and evaporate beds (anhydrite and gypsum). This dolomite unit is interbedded with shale and exhibits parting in which gypsum and calcite have formed as a secondary filling. The Tymochtee Dolomite has been cored to a depth of 125 feet beneath the site. Descriptions of the cores confirm the general descriptions given above and show highly weathered zones and that most solution cavities were relatively small (less than one inch).¹⁹

The top of bedrock in the region has been mapped by Hoover²⁰ (Figure 7). This map shows the site in relation to the major top of bedrock features around the site. As can be seen in this figure, a major bedrock valley exists to the west of the facility (trending north-south). The eastern side of the buried valley on which the facility is located has a uniform slope, with no other major buried valleys intersecting it.

The top of bedrock under and immediately around the site has been mapped from data collected from the geotechnical borings, piezometers, and monitoring wells (Figure 8). This figure shows a bedrock ridge south of the facility that trends southwest-northeast and a general flat area under the site. Both Figure 7 and 8 show that the bedrock surface is sloped toward the north.

F. Hydrogeology

1. General

The major sources of ground water in the region surrounding the site are:

- Tymochtee Dolomite
- Greenfield Dolomite
- Lockport Dolomite

These formations have solutioning and jointing (i.e., fractures) that enhance their porosity, transmissivity, and storativity. In the area around the facility, these formations are under confined conditions.

The glacial overburden is saturated to within 2-5 feet of the ground surface. The glacial overburden is not used as a domestic or commercial water supply except for sand and gravel valley deposits.¹⁹

In the Tymochtee Dolomite, regional flow is to the north-northwest as shown in Figure 9. The major recharge area is reported to be to the southeast where the Tymochtee comes to within a few feet of the surface.¹⁹ The glacial overburden acts as a leaky confining layer under the facility. Flowing artesian conditions do not exist at the site but can be found around the facility in Riley, Green Creek, and Townsend townships.

2. Ground Water Flow in the Bedrock

Ground water flow in the dolomite bedrock under the facility has been interpreted from water level data collected over several years. Golder and Associates¹⁹ presents a typical potentiometric map for the bedrock units for the period between 1982 and 1984 (see Figure 10). This map shows the radial flow pattern (identified by Bowser-Morner) which is produced by pumping on-site. This flow pattern is characteristic of this period and is anticipated when the site becomes active and pumping begins. Other examples of potentiometric maps from this two-year period that show similar flow patterns can be found in Reference 19.

The bedrock units are quick to respond to pumping stresses at the site. This is typical of a confined aquifer with fracture flow. The quick response to pumping stress is clearly demonstrated in Figure 11, which is a potentiometric map produced from water levels measurements taken after eight hours of steady pumping. The flow directions are radially inward toward the pumping well and gradients are relatively high.

Under nonpumping conditions these units quickly recover toward natural flow and gradient conditions. Figure 12 is a potentiometric map made from water

level measurements taken after the truck wash well at the facility had been shut down for a minimum of eight hours. This shows a flat potentiometric surface under the facility with a slight gradient to the north.

An accurate determination of flow rate and direction is necessary to perform an adequate assessment. The Task Force has concerns regarding the lack of information on flow rate and direction in the bedrock (discussed below).

CWM-V has estimated flow rate in the bedrock using Darcy's law to be 1600 ft/yr.³² Because this is a fracture flow system, the assumptions of Darcy's law may not apply. Based upon these findings, the Task Force feels the estimate of flow rate may be inaccurate, and most likely low.

The flow direction is north-northwest under the site based upon water level data collected to date. Karst conditions have been reported to be near the site, but have not been identified as a major feature in the bedrock at the site. If large solution cavities exist beneath the site, flow direction could differ from that described in site-specific geologic reports.

3. Ground Water Flow in the Glacial Overburden

The potentiometric surface in the overburden (Figure 13) was estimated from water levels taken between June and August 1984. The Task Force is not aware of any potentiometric maps for the glacial overburden produced before this. At the time this map was generated, Ponds No. 4, 5, 7, 11, and 12 contained fluids which strongly influenced the flow directions in the overburden. As the map illustrates, ground water mounds existed under these ponds. Ground water mounding under material used to fill the old ponds No. 1, 3, 4, 9, and 10 can also be seen. Mounding occurs because of the large hydraulic heads available

from the ponds and their elevation relative to the ground surface.¹⁹ The relatively steep gradients along the edge of the mounds were caused by the low permeability soils which restrict seepage (flow) and allow rapid head loss.

Site alterations have caused changes in the potentiometric surface in the glacial overburden. Ground water data obtained in January 1986 were used to create the potentiometric map shown in Figure 14. As this map indicates, Ponds No. 4, 5, and 7 have been emptied and the ground water mound under them and the other closed ponds (1, 2, 3, 9, 10) had dissipated at this time. A mound still existed under Ponds No. 11 and 12, which still had fluid in them. A small mound exists that is associated with the stockpile of hazardous material removed from Ponds No. 4, 5, 7. With the exception of these ground water mounds, the overall flow in the overburden is generally to the north.

Ground water levels measured by the Task Force and those used to create the potentiometric maps in Figures 13 and 14 are given in Tables 1 through 3. Comparing water levels in the various well nests indicates that the water levels decrease with depth, which indicates a downward vertical gradient toward the bedrock.

G. Ground Water Monitoring System

1. Historical Ground Water Monitoring System

During the 1970's, both CWM-V and the Ohio EPA monitored ground water at the site. They used the same wells but gave them different designation numbers (e.g., Ohio EPA No. 1 is equivalent to CWM No. 4). Ultimately this older ground water monitoring system evolved into a 12-well system which was originally used by CWM to satisfy 40 CFR Part 265 ground water monitoring requirements.

The following section describes how the older ground water monitoring system evolved. The Task Force has given the Ohio EPA wells the prefix "OEPA" and the CWM-V wells the designation "MW".

In addition to the monitoring wells, several piezometers have been installed. Some of these piezometers have been sampled at various times. One piezometer in particular, P-10, has shown contamination (discussed in Section J.2). Figures 5 and 13 show the location of the piezometers.

In 1972 the Ohio EPA began monitoring four wells, MW-4 (OEPA-1), MW-5 (OEPA-2), MW-8 (OEPA-3), and OEPA-5 (Figure 15). Two of these wells were on-site and two were off-site. In 1974, CWM-V added an on-site testing laboratory and another monitoring well, OEPA-4, to the system. In 1976 the Ohio EPA added OEPA-6. Between 1976 and 1978, CWM-V added monitoring wells MW-1, 1A, MW-2, MW-3, 3A, MW-6, and 6A. In 1979, the steel-cased wells were abandoned and new PVC-cased wells were installed and renumbered MW-1N, MW-3N, MW-4N, and MW-6N. A new well, MW-7, was also added at this time. In 1981, three more monitoring wells (MW-11, MW-12, and MW-13) were added to the north of the existing waste management area.

By 1982, the monitoring system at CWM-V site had evolved to include eleven wells: MW-1N, MW-2, MW-3N, MW-4N, MW-5, MW-6N, MW-7, MW-8, MW-11, MW-12, and MW-13. As indicated above, these wells were used initially to satisfy the ground water monitoring requirements specified in 40 CFR Part 265 (RCRA).

2. Current Ground Water Monitoring System

In 1983, the USEPA determined that the wells in this monitoring system did not satisfy the requirements of 40 CFR Part 265 based upon inadequate well construction, location, and depth. As a result of these findings, CWM-V agreed

to enter into a Consent Agreement and Final Order (CAFO) on April 5, 1985, with the USEPA. The CAFO required, among other things, that new wells, constructed of type 316 stainless steel, be installed at several locations and depths. As a result of the CAFO, a workplan was developed describing a new monitoring system. The workplan was originally submitted in May 1985 and was modified in four addenda (numbers 1 through 4) dated August 5, August 27, and October 17, 1985, and February 11, 1986, respectively. The workplan was approved by the USEPA and the Ohio EPA on November 29, 1985, and January 6, 1986, respectively.

The CAFO monitoring system is designed to provide ground water monitoring for the glacial overburden and the bedrock. The new monitoring wells are designated by a number and several letters. The number corresponds to continuously sampled boreholes that were made during the continuous borehole study.⁶ Information gathered during this study was used to design the monitoring wells in the new system. The letter designations are used to differentiate wells completed in the lacustrine deposits (L), till deposits (T), and the bedrock (MW).

The CAFO specified the new monitoring wells be installed in accordance with the following schedule:

Phase 1

- (1) Within 90 days after approval of the Workplan by the USEPA and the Ohio EPA, install wells MW-14R, MW-19R to MW-24R, L-14, L-19 to L-23, L-26 to L-35, T-14, T-19, T-23, T-24, and T-27.
- (2) Within 90 days after excavation of the fixed sludge soil and rip-rap from ponds 4, 5, and 7, install wells MW-15R, MW-16R, L-15, and L-16.

Phase 2

- (3) Within 90 days after removal of the clay liner beneath the temporary stockpile and regrading of the area, install wells MW-17R, MW-18R, L-17, L-18, L-25, T-17, and T-18.

Phase 1 monitoring wells were installed by November 1, 1985, in advance of the required schedule. Phase 2 monitoring wells will be installed in accordance with the requirements of paragraph 3 of the CAF0. These wells have been designated with a "P" on Figures 15 through 17. In addition to the wells specified in the CAF0, the Task Force is recommending locations for additional monitoring wells, designated with an "R" on the figures. The recommended wells are discussed further under Section C (Downgradient Wells) below.

Table 4 lists general information for all wells at CWM-V. Figures 15 through 17 show the location of the new monitoring wells by the stratigraphic interval monitored (lacustrine, till, and bedrock, respectively). Wells with the same number on different figures are located at the same location.

The CAF0 monitoring system is being used to meet the performance standards of 40 CFR Parts 265, Subpart F. There are two parts to the CAF0 monitoring program, an "Initial Ground Water Program" and a "Continuing Ground Water Program." The Initial Ground Water Program was completed in May 1986. The Continuing Ground Water Program is currently being followed by CWM-V, and calls for semi-annual monitoring for a list of contaminants agreed upon by the USEPA, the Ohio EPA, and CWM-V. According to the CAF0, CWM-V must submit the results of the Initial Ground Water Program and the Continuing Ground Water Program to USEPA and OEPA within 30 days after receipt of the final results of all the analyses in that set by CWM-V. At the time of the Task Force investigation, CWM-V had not complied with this requirement of the CAF0.

Analytical results from the initial and continuing CAFO monitoring has revealed contamination in several wells (see Section J of this report). CWM-V has not submitted an assessment plan as required in 40 CFR 265.93 or installed additional wells to define the rate and extent of contamination found in the wells. The Task Force finds that the existing system is inadequate for assessment purposes.

a. Upgradient Wells

Wells MW-23RA, MW-24R, MW-37R, and MW-38R are bedrock monitoring wells that are upgradient of the facility during natural and pumping conditions. Wells MW-23RA, MW-24R, and MW-37R are part of the CAFO Continuing Ground Water Program and are constructed of stainless steel casings and screens. Well MW-38R is a CWM-V research well constructed of PVC and is not intended to be part of the RCRA ground water monitoring system. All three of the upgradient stainless steel wells appear to be properly located and constructed for ground water monitoring to determine background water quality.

Wells T-23, T-24, T-37, and T-38 are till monitoring wells upgradient of the facility. As with the upgradient bedrock wells, T-23, T-24, and T-37 are constructed of stainless steel casing and screens and were installed as part of the CAFO. Well T-38 is a CWM-V research well constructed of PVC.

CWM-V had trouble finding a location upgradient of the facility at which the lacustrine deposit was present. Wells L-23 and L-39 are wells upgradient of the facility and screened in the lacustrine zone. The wells are both constructed with stainless steel casing and screens.

b. Downgradient Wells

The new CAF0 wells which are considered downgradient by CWM-V are shown in Table 5. L-series and T-series wells are referred to as lateral gradient wells in Table 5. All wells except those described in the previous section should be considered downgradient wells for detection monitoring. The location, depth and construction of these wells appear adequate to determine if the hazardous waste management units are leaking at the facility, with the exceptions given below. Contamination has been detected in some of the wells on site (see Section J); thus a ground water assessment should be conducted by CWM-V.

Delays in approving the closure plan have left the facility unmonitored in the northeast area, specifically around the stockpile. Several wells are proposed for this area (L-17, L-18, L-25, T-17, T-18, MW-17, and MW-18). The Task Force recommends that the Phase 2 wells be completed as soon as possible.

As discussed earlier, the "runoff retention pond" to the east of the stockpile was found to contain hazardous waste leachate by the Task Force, and therefore is considered by the Task Force to be a RCRA-regulated unit. As such, a RCRA approved closure of this area is necessary. Based upon these findings, the Task Force recommends a minimum of three lacustrine wells be installed at the location shown on Figure 16 to the east of the retention pond. Shallow lacustrine deposits would be the first to become contaminated if the retention pond is leaking.

Finally, one additional bedrock monitoring well is recommended at the location of L-30. During pumping conditions at the site, this location is downgradient of the proposed closure cell as well as the areas being closed in

the eastern portion of the facility. Therefore, the Task Force recommends a bedrock well be installed to help detect immediate contamination to the bedrock from these areas. This is also provided for under paragraph H of the CAF0.

c. Well Construction

All wells in the CAF0 monitoring system are constructed of stainless steel casing and screens. Future wells proposed under the CAF0 will also be constructed of the same material. Reference 25 gives details of how the wells were constructed and completed. The new wells appear to be adequately constructed and completed based upon the discussion in this document and the workplan.¹¹

3. Sampling and Analysis

a. Sampling and Analysis Plan (SAP)

The SAP for CWM-V consists of two separate documents. One is a general Waste Management, Inc., Manual for Ground Water Sampling (MGWS)²⁴ and the other is a Site-Specific Ground Water Monitoring Plan (SSGWMP)²⁵ for the Vickery facility. A number of deficiencies in these plans were noted by the Task Force:

- When the well heads are first approached by the sampling team, no organic vapor monitoring is required by the above-mentioned plans. This type of monitoring would give an initial indication of the presence of volatile organics in the well. It could also be used to help determine the level of personal protection necessary while sampling the well.
- No indication is given in the above-mentioned plans that the sampling team should be checking the well for immiscible layers such as low density (floaters) or high density (sinks) contaminants.

- There is no requirement in the above-mentioned documents to decontaminate the cable used to lower the electric water level indicator into the well unless visible contamination is present. Although when a weighted tape is used for water level measurement it is required to be decontaminated (see item 2 on page 65 of the MGWS²⁴). The cable used to lower the electric water level indicator should also be decontaminated.
- CWM-V's field form CC2 does not provide for documentation of sampling time for pH, conductivity, and temperature measurements.
- A low-yield well is only required to be purged one well volume by the above-mentioned documents. Low-yield wells should be purged to dryness or three well volumes, whichever comes first.
- Field parameters (pH, temperature, and specific conductance) are only analyzed in the beginning of the sampling order. The TEGD²⁷ and the Task Force recommend that the field parameters be measured both at the beginning and end of the sampling order.
- Total organic carbon (TOC) and extractable organic samples (except volatile organics (VOAs)) are required to be filtered according to the above-mentioned plans. This is an incorrect procedure and will cause all of these analyses to be biased low.

b. Sample Collection and Handling Procedures

The Task Force observed the facility's sampling procedures during the Task Force sampling effort. One questionable protocol practice was noted during the HWGWTF activities. This involved the method of cleaning the cable of the water level detection instrument. Only the probe is rinsed after it has been reeled up. It would be more appropriate to wipe and/or rinse the cable as it is being reeled up to minimize possible cross-contamination of wells.

A very small segment of facility sampling procedures was observed on April 15, 1987. These activities occurred at well T23A, a bailer equipped well. This was the second day of sampling at this site. Samples were collected

for total and dissolved metals, chloride, sulfide, and phenol analyses. All sampling activities followed facility protocol. All sample water, except that for total metals, was filtered on site. Samples requiring preservation were immediately preserved upon collection or completion of filtration. Sample water for parameters collected on this day were placed in brown glass bottles. The filtering device was Teflon® lined and had a capacity of 1500 mL. The device was driven by compressed nitrogen delivered at 40 psi using a regulator. The filtering device was fitted with a 0.45 micron filter. The filter unit was rinsed with deionized water and dried with a paper towel between uses. At Well Wizard®-equipped wells the facility used an in-line filter, a QED model FF-8000 (0.45 micron) to filter samples. The operation or use of this device was not observed. If such a device is used there did not appear to be a protocol for it in the sampling and analysis plan. Sample parameter types that were not filtered were field parameters (pH, conductivity, temperature), oil and grease, solids, VOAs, total organic halogens (TOX), and total metals. The two filtering methodologies used appeared to be acceptable for those parameters which should be filtered, except for the previously discussed errors and omissions. In the case of phenols there is concern that filtering of any kind may still introduce a negative bias. Under basic conditions, phenols can form calcium phenoxide (not water soluble) which would be removed by the filtering process.

From the observations of well sampling procedures performed at well T23A as well as procedures used to obtain samples for the Task Force it appeared that all protocols are followed by CWM-V's sampling team. In summary, a number of protocol concerns have been identified above or in the SAP review. Those identified in this section include cleaning of water level instrument cable, lack of filtering protocol for "Well Wizard®"-equipped wells, and bias introduced by filtering of phenol samples.

c. Off-Site Laboratory Evaluation

Two off-site laboratories are used by CWM-V. All samples are sent to Environmental Testing and Certification (ETC), Inc., in Edison, New Jersey. ETC does all of the organic and most of the inorganic analyses. Total phenolics and sulfates are subcontracted out by ETC to Chyun Associates for analysis. Both of these laboratories were evaluated by the Task Force and that evaluation can be found in Appendix B of this report. A number of minor deficiencies were found at these laboratories, most of which may have already been corrected. Based on these evaluations, the Task Force concludes that CWM-V's past ground water self-monitoring data should be classified as follows:

Inorganic and Indicator Parameters - Qualitative
Volatile Organics - Quantitative
Semivolatile Organics, PCBs, and Pesticides - Qualitative, Biased Low

H. RCRA Permit (40 CFR 264 and 270)

The original Part B of the RCRA permit application (40 CFR 264 and 270) was submitted to the USEPA, Region V, on May 16, 1985. Additional information was submitted on November 7, 1985. The original application was deemed inadequate and a Notice of Deficiency (NOD) was issued on May 16, 1986. Additional information was submitted on September 26 and October 7, 1986. The RCRA Permits Section of Region V and the Ohio EPA are currently reviewing the new information.

This permit application addresses hazardous waste treatment and storage at the facility using equipment at or above the ground surface (e.g., tanks) which would not require a ground water monitoring program. The application does not address the closure of the ponds (surface impoundments) or the proposed hazardous waste disposal cell which requires ground water monitoring. The ground water

monitoring program is addressed in the CAF0. Closure of these units will be conducted under the authority of 40 CFR 265. Eventually, the permit will have to be modified to include the post closure monitoring requirements of the closed portion of the facility.

I. Task Force Sampling

1. Methods

All samples were collected by a USEPA contractor, Alliance Technologies Corporation (Alliance) using all of the appropriate guidelines mentioned in Reference 28. Sampling by Alliance was performed under the supervision of EPA personnel. CWM-V contractor personnel operated the CWM-V owned sampling equipment as directed by Alliance and USEPA representatives. Dedicated facility sampling equipment was used at each well site. The facility contractor was IEP, Inc., of Westerville, Ohio. Replicate volatile organic samples and splits of all other samples were offered to the facility. This offer was declined. Alliance provided equipment used to collect surface water samples along with all sample containers and preservatives used for the Task Force samples. Alliance also provided all equipment and materials necessary to manage, handle, field filter, document, and ship the required samples. Field analyses (in situ data) were also performed by Alliance.

All wells were monitored for organic vapors when first opened. Prior to purging or sampling the monitoring wells, water levels were measured in all wells for use in the geological evaluation of the site. Monitoring well sampling was preceded by purging operations (using bailers or pumps). When possible, a volume equal to three times the volume of water present in the well was evacuated. If it was not possible to obtain the three well volumes, the well was purged to dryness.

Purge water disposal was the responsibility of the facility. Purge volumes were measured in calibrated buckets. In all cases purge water was spilled on the ground by facility personnel a short distance from the well being purged. Wells that were purged to dryness were sampled when there was a sufficient recharge volume of water to fill at least one parameter bottle set. In a few extreme cases this practice was not strictly followed. Six of the 18 wells sampled were purged to dryness on one day and sampled on the next day(s). Wells that were not purged to dryness had three well volumes removed before sampling. Slow recharging wells were also sampled when there was a sufficient volume of water for at least one parameter bottle set. For example, the extractable organic samples had to be collected when there was a sufficient volume of water in the well (4 liters) for all of the extractable organic bottles. For 12 of the 18 wells sampled, it was necessary to return to the same well on successive days in order to obtain a complete set of samples. A summary of purging and sampling data can be found in Appendix C.

A total of 18 wells were sampled at this facility. Eight of the wells were equipped with bladder pumps (Well Wizards®); the remainder were equipped with stainless steel bailers with Teflon® check valves. Sample bottles were filled directly from a short segment of Teflon® tubing connected to the top of wells equipped with bladder pumps. Sample bottles were also filled directly from stainless steel bailers by pouring from the top of the bailer. The surface water sample was collected directly into the sample containers. Leachate samples were obtained using an intermediate glass sampling container from which the sample bottles were filled. These intermediate containers were from the standard stock of sample bottles used by Alliance.

Table 6 lists the parameters (analytical groups), sample bottle types, and preservatives used in this survey. The parameters are listed in the order in which they were sampled. All samples were shipped for analysis to the contract laboratories indicated below:

<u>Laboratory</u>	<u>Location</u>	<u>Components to be Analyzed</u>
Compu-Chem EMSI Centec	Research Triangle Park, NC Camarillo, CA Salem, VA	Dioxins, Furans Organics Inorganics

All shipments were made in accordance with applicable Department of Transportation (DOT) regulations (49 CFR Parts 171-177). Leachate and suspected contaminated samples were shipped as "medium-level hazardous" and other samples from wells and surface points were shipped as "environmental". All samples were collected in accordance with guidance in Reference 29.

Each sample shipment was accompanied by a chain-of-custody record, completed by Alliance, identifying contents in terms of sample type, date and time, etc. The original records accompanied the shipment, and a copy was provided to the Field Team Leader. No samples were split with the facility.

All samples taken from the CWM-V site were documented with a receipt for samples form, completed by Alliance. The sample tag serial numbers from all samples shipped off site were recorded on the form, and a copy of the receipt was provided to facility personnel. Alliance also performed all analyses for pH, specific conductance, temperature, and turbidity, as well as field filtering of the dissolved metals samples. Samples were designated to be analyzed for the constituents listed in Appendix D.

Quality assurance and control (QA/QC) for USEPA contractor sample collection, handling, and analysis were conducted in accordance with the appropriate protocols in Reference 28. The Sampling Team monitored Alliance procedures during the sampling effort to ensure consistency with the QA/QC and evidence handling requirements. In addition, the following QA/QC samples were required.

a. Blank Samples

These samples included field blanks, equipment blanks, and trip blanks. Field blanks were prepared by Alliance using distilled deionized water of known high purity, and unused sample bottles. Alliance prepared two field blanks at representative sampling sites (well sites L-15 and L-35) for all parameters sampled during the inspection. Alliance prepared one set of trip blanks for each type of analysis (e.g., organics, metals, volatiles) prior to departure from its home office in Bedford, Massachusetts. The trip blank accompanied the sampling crew throughout the entire sampling procedure and was submitted for analysis along with the last day's samples. Equipment blanks were not prepared by Alliance, as all equipment which contacted sampled liquids was supplied by the facility in the form of dedicated sampling devices, bailers, and pumps.

b. Duplicate Samples

At each sampling location where volatile organics were sampled, duplicate samples (i.e., two VOA vials) were taken. Samples at two sample locations were collected in duplicate for all parameter types. The duplicate sample site locations are identified in the following section.

2. Sampling Location

The sampling locations for this investigation are listed below:

<u>Lacustrine Wells</u>	<u>Till Wells</u>	<u>Bedrock Wells</u>
L-15 (field blank site)	*T-19	*MW-14R
L-19	T-24 (background)	*MW-16R
*L-20		*MW-21R
L-21		*MW-23RA (background)
*L-26 (duplicate)		P-10
L-27		
*L-29		
L-31		
L-34 (duplicate)		
L-35 (field blank site)		
L-39 (background)	*Wells equipped with dedicated bladder pumps.	

Non-Ground Water Sites

Waste Pile Leachate (1)
Surface Water (1)

Quality Assurance Samples

Duplicate Samples (2) Designated Above
Field Blanks (2)
Trip Blank (1)

3. Scheduling

Prior to sampling activities, water levels were measured in all available wells for use in the geological evaluation. This was performed earlier, on March 29, 1987, by facility personnel, with USEPA supervision. Many logistical considerations, particularly well performance, affected the time required to obtain the samples and influenced the sequence of sampling. The Sampling Team Leader, in conjunction with the Technical Review Team, identified one additional sampling point (well P-10) during the on-site inspection. This well was then added to the schedule. Special scheduling effort was also required to complete the leachate sampling because the sampling points were located in an area designated as a TSCA waste storage site which required that special safety precautions be taken.

The Sampling Team members calculated water volumes in each well from the static water levels measured at the time of purging, and then proceeded to remove three well volumes. Task Force Field Team members recorded the above data in the field logbooks, as well as the starting and ending times of purging, sampling times, and unusual activities taking place in the area during purging and sampling. Unique characteristics of the monitoring well or its contents were also noted by the Sampling Team.

Field work began on Monday, April 6, 1987, and was completed on April 14, 1987. The actual sampling work was conducted during the hours of 0800 to 1700.

J. Ground Water Quality Interpretation

1. Task Force Analyses

Samples were analyzed by the USEPA contract laboratories for the parameter groups shown in Appendix D. Laboratory analytical results were obtained from three USEPA contractor laboratories participating in the Contract Laboratory Program (CLP). Standard quality control measures were observed including:

- Analysis of field and laboratory blanks to allow detection of possible contamination due to sample handling;
- Analysis of laboratory spike samples and performance evaluation samples;
- Analysis of laboratory and sample duplicates to estimate precision; and
- Review and interpretation of the results of these control measures. These procedures can be found in Reference 30.

The QA/QC summary can be found in Appendix E. Appendix F is a table of the analytical results for all constituents found above the limits of detection. Appendix D provides a summary, by parameter, of the analytical techniques used and the reference methods for the sample analyses.

2. Data Interpretation

a. Organics

Results from six monitoring events at CWM-V were available to the Task Force for use in evaluating the presence of specific organic compounds in the ground water at CWM-V. These consist of an October and December 1983 volatile organic (VOA) sampling, the April and October 1986 plus the April 1987 Consent Agreement and Final Order (CAFO) monitoring events, and the Task Force sampling.

(1) Methylene chloride

Positive results for methylene chloride were found in two bedrock wells in 1983; six lacustrine and one till well in April 1986; eight lacustrine, three till and eight bedrock wells in October 1986; eleven lacustrine, four till, and two bedrock wells in April 1987; and two bedrock, one till, and four lacustrine wells in the Task Force results. Most of these results can be disregarded because the results are below background levels for that particular sampling event and ground water zone or, as in the case of the Task Force sampling, because methylene chloride was also found in the blanks associated with that sample. With this in mind, the following selected methylene chloride sampling results remain of concern to the Task Force because they were above background levels:

<u>Sampling Event</u>	<u>Well</u>	<u>Methylene Chloride (ppb)</u>
1983 (VOA)	3N	53
October 1986 CAFO	MW-16R	34.2
	MW-21R	25.2
	MW-38R (background)	21.0
April 1987 CAFO	L-22	40.2
	L-23A (background)	8.97

The Task Force recommends that methylene chloride results from these wells be tracked closely with increased monitoring to determine if these results are significant.

(2) Methanol

Methanol was found by CWM-V in two wells, L-20 at 92.1 ppm and MW-38R at 19.3 ppm, during the April 1986 CAF0 sampling event. No methanol was found in any wells during the October 1986 or April 1987 CAF0 sampling events. The Task Force did not look for methanol in its sampling program. It should be noted that in the April 1987 CAF0 sampling, the detection level for methanol increased from 10 ppm (in 1986 samples) to 60 ppm and in the case of L-19 and T-19, 100 ppm. These detection levels need to be explained by CWM-V since the new detection levels are above concentrations found in the April 1986 sample. Due to the presence of methanol stated above, the Task Force recommends that methanol results be tracked closely with increased monitoring to determine if these results are significant, and that the detection level be reduced to the previous level of 10 ppm.

(3) Methyl ethyl ketone (2-butanone)

Methyl ethyl ketone (MEK) has been found by CWM-V as shown below:

<u>Sampling Event</u>	<u>Well</u>	<u>Methyl Ethyl Ketone (ppb)</u>
April 1986 CAF0	L-34	12.0
October 1986 CAF0	L-34	12.3
	L-35	31.7
	MW-14R	11.5
	MW-21R	11.7
	MW-23R	18.1
	MW-24R	11.2
	MW-38R	11.6

The Task Force did not find significant concentrations of MEK (2-butanone) in its samples and what was found was disregarded after quality assurance review of the data. Thus, the Task Force did not confirm the presence of MEK in the ground water and recommends that MEK results be tracked closely with increased monitoring to determine if these results are significant.

(4) 1,2-Dichloroethane

This organic compound has been detected during the sampling events stated below:

<u>Sampling Event</u>	<u>Well</u>	<u>Concentration (ppb)</u>
April 1986 CAFO	L-19	10.1/8.81
October 1986 CAFO	L-19	12.1
Task Force-April 1987	L-19	5
April 1987 CAFO	L-19	9.1

The Task Force also found trace levels (1-2 ppb) of 1,1-dichloroethane in wells L-19 and L-26. The consistent presence of 1,2-dichloroethane during each sampling of L-19 is of concern to the Task Force. The Task Force recommends that a ground water quality assessment be conducted to determine the rate and extent of 1,2-dichloroethane migration at the site.

(5) Other organics

CWM-V's self-monitoring data show the following specific organic compounds detected (other than those already mentioned) during the sampling events stated:

<u>Sampling Event</u>	<u>Well</u>	<u>Organic Compound</u>	<u>Concentration (ppb)</u>
October 1983 VOA	1N	Benzene	12
	P-10	Benzene	113
		Toluene	44
December 1983 VOA	P-10	Toluene	289
		Ethylbenzene	350
		Chloroform	5.92
October 1986 CAFO	MW-23RA		

Specific organics found by the Task Force sampling efforts are listed in Appendix F. In summary, the Task Force found the following number of valid specific organic compounds in each well:

<u>Well</u>	<u>Number of Organic Compounds</u>	<u>Well</u>	<u>Number of Organic Compounds</u>
L-15	6	L-35	1
L-19	6	L-39	0
L-20	8	T-19	1
L-21	1	T-24	0
L-26 (duplicate)	23	P-10	19
L-27	0	MW-14R	0
L-29	0	MW-16R	1
L-31	0	MW-21R	2
L-34 (duplicate)	3	MW-23RA	16

Note that acetone, methylene chloride, 2-butanone (MEK), bis(2-ethylhexyl) phthalate, 2-methylcyclopentanol, the compounds specifically stated as unknown, and the unknown alkylamide results were disregarded in this count, after the quality assurance review of the data. Other classes of unknowns, as identified in Appendix F, were used in the above count. It should be noted that the term "unknown" as it is used in the Task Force results means that the organic compound could not be identified by the laboratory. The count noted above for duplicate samples (L-26 and L-34) includes some compounds that only were found in one of the two duplicate samples. The high number of organic compounds found in some of the Task Force samples indicates the need for a ground water quality assessment at CWM-V.

b. Indicator Parameters

(1) Total organic halogens (TOX)

Many of the lacustrine zone monitoring wells show high TOX values. This is especially true of L-26 (values range from 1313 to 2080 ppb) to the south of the waste pile. Other wells such as L-15 (range from 131 to 310 ppb), L-19 (range from 177 to 273 ppb), L-20 (range from 397 to 1173 ppb), L-28 (range from 189 to 204 ppb), and L-30 (range from 295 to 1069 ppb) also

contained high TOX values. A number of the other lacustrine wells have never been analyzed for TOX, such as wells L-21, L-22, L-29, L-31, L-32, L-33, L-34, L-35, 1A, and 6A. The Task Force concludes that these results indicate possible contamination of the ground water, in the lacustrine zone, from the hazardous waste pile or the old lagoons on site. The source and extent of this contamination must be specifically determined by CWM-V in a ground water quality assessment. An expanded monitoring program for TOX should be implemented for all lacustrine wells on site, and the specific halogenated organics or other compounds that are causing the high TOX values should be identified.

Some of the bedrock wells have also shown significant TOX results. CWM-V results indicate that wells 1N, 2, 3N, 6N, 7, 8, 11, 12, 13, and MW-37R show the periodic presence of significant (greater than 100 ppb) TOX levels. The Task Force results found MW-14R (120 ppb) and MW-23RA (129 ppb) to be high in TOX. These results are confusing because some of these wells are somewhat removed, both horizontally and vertically, from the waste management units. The cause for these periodic high TOX values in the bedrock wells should be investigated and explained by CWM-V.

(2) Ammonia, chemical oxygen demand (COD), and oil and grease (O&G)

These parameters have been analyzed in samples from only the non-CAFO wells. Significant COD levels (greater than 50 ppm) have been found in all non-CAFO wells, with wells 1, 1N, 1A, 4N, 6N, 11, 12 and 13 showing more significant numbers of high results than the rest of the wells. Well 1 contained levels as high as 600 ppm of COD. Also, periodic high results for O&G (greater than 10 ppm) have been found in wells 1, 3A, 4, 4N, 5, 6,

6N, 6A, 11, and 12. All of the non-CAFO bedrock wells show at least periodic high ammonia levels (greater than 0.5 ppm). Well 8 is a background bedrock well and it also contained ammonia levels as high as 1.5 ppm. Wells 1N, 3N, 6N, 7, 11, and 12 all contained ammonia concentrations over background levels found in well 8, with well 12 being as high as 20 ppm.

Though well construction may be a factor in some of these results, the Task Force concludes that the above-mentioned results indicate potential ground water contamination at CWM-V. It is recommended that additional monitoring of ammonia, COD and O&G be initiated for all monitoring wells on site.

(3) Other indicator parameters

Self-monitoring data from old bedrock wells 3 and 6 show somewhat consistent high pH results. The Task Force concluded that these older wells were probably grout contaminated and were not indicating ground water contamination for pH. This conclusion is also based on the fact that replacement wells 3N and 6N have shown no high pH levels. Also, total coliform bacteria have been found to periodically exceed the USEPA drinking water standards in wells 7, 8, 11, and 12; but these levels do not exceed the background levels found in well 8. Thus, these results are not considered to be an indication of ground water contamination caused by CWM-V.

Total organic carbon (TOC) has been found to be high (greater than 100 ppm) in well 1A. Also, periodic high levels of radionuclides have been found to exceed the USEPA drinking water standards and background levels in bedrock wells 1N, 2, 5, 6N, 7, and 12. CWM-V does not monitor the CAFO

wells for the above-mentioned parameters. The Task Force recommends further investigation, by CWM-V, into the source of the above-mentioned TOC and radionuclide levels. The CAF0 wells should also be analyzed for these parameters.

Most of the wells on site have been found to contain above detectable levels of total phenol, but not all of the wells have been found to contain values above background levels. The highest background levels are noted below:

<u>Zone</u>	<u>Well</u>	<u>Total Phenol (ppb)</u>
Bedrock	8	180
Till	T-23	15
Lacustrine	L-39	19

Wells that have been found to contain total phenol levels above background levels are as follows:

	<u>Well</u>	<u>Total Phenol (ppb)</u>
Bedrock	1	188
	1N	89,000
	3	480
	6	380
	7	280
Till	T-19	21
	T-27	53
Lacustrine	1A	400
	3A	120
	L-20	73
	L-26	59 (Task Force results)
	L-35	28

Although the results are scattered, they indicate contamination may exist around wells 1, 1N, and 1A. The Task Force recommends increased monitoring and further investigation into the total phenol levels on site.

c. Inorganic Parameters

A number of inorganic (heavy metals) constituents have been found in the ground water through facility self-monitoring and Task Force analysis. Those found were arsenic, cadmium, and chromium.

(1) Arsenic

Arsenic has been found by CWM-V in self-monitoring data from well 11 (50 ppb) and well 12 (60 ppb). These were one time results which are at or over the USEPA drinking water standard of 50 ppb. Due to the horizontal and vertical distance of these wells from the waste management units at the site and the fact that no other bedrock wells closer to the waste management units have been found to contain such levels of arsenic, the Task Force does not consider these results to indicate ground water contamination from CWM-V. The Task Force does recommend that arsenic continue to be monitored for indications of any developing trends.

(2) Cadmium

Cadmium has been periodically found by CWM-V to exceed the USEPA drinking water standard of 10 ppb in nine of the non-CAFO bedrock wells. Background well 8 had the highest value of 4820 ppb. The highest nonbackground value for cadmium was found in well 6N at 47 ppb. Since the high result in well 8 has never been duplicated (all other results from well 8 have been below detection levels) it is probably an error. The same conclusion could be drawn for the cadmium levels found in the other bedrock wells on site since the highest results were seldom duplicated in the numerous analyses done on these wells. Thus, the Task Force cannot conclude that these cadmium results indicate ground water contamination from the waste management units.

In the lacustrine zone, well 1A has a consistent history of cadmium contamination with the highest value found at 81 ppb. This well has not been sampled since 1980 and has been abandoned. The lacustrine zone around this old well is probably contaminated and the Task Force recommends that a ground water quality assessment be initiated in this area. The Task Force sampling found 13 ppb of dissolved cadmium in well L-19. This may indicate that the lacustrine zone near L-19 is contaminated. The Task Force recommends further investigation into this possibility.

(3) Chromium

Fourteen lacustrine wells have been found to have chromium levels that exceed the USEPA drinking water standard of 50 ppb. Only seven of them exceed the highest background level of 150 ppb found in well L-23. These seven are L-14 (350 ppb), L-16 (390 ppb), L-19 (290 ppb), L-21 (301 ppb), L-30 (210 ppb), L-33 (780 ppb), and L-34 (392 ppb). These results are an indication of contamination and the Task Force recommends a ground water quality assessment be conducted.

d. Areas of Concern

(1) Bedrock wells

Many of the older bedrock wells (1, 1N, 2, 3, 3N, 4, 4N, 5, 6, 6N, 7, 8, 11, 12, and 13) have been found to contain high TOX, COD, O&G, ammonia, radionuclides, and total phenol. The Task Force suspects that these results indicate periodic contamination of the bedrock ground water zone by CWM-V, but further study is needed to confirm this. Of the newer (CAFO) bedrock wells, only MW-23RA showed significant organic contamination, and the sample had a sulfide odor when collected by the Task Force. MW-23RA is

considered to be a background well by CWM-V, but these sample results indicate this well is contaminated, possibly from another source, and is of questionable value as a background well. Piezometer well P-10 has been found by CWM-V to be contaminated with benzene, toluene, and ethylbenzene. The presence of these compounds was confirmed by the Task Force sample results. The Task Force also found 16 other specific organic compounds in its sample and noted that the sample had a sulfide odor when it was collected. The bedrock zone around well P-10 is definitely contaminated and the Task Force recommends that the rate and extent of this contamination be identified in a ground water quality assessment.

(2) Till wells

The Task Force found no indication of contamination in the till wells that exist on site.

(3) Lacustrine wells

Three of the older wells at CWM-V are lacustrine wells (1A, 3A, and 6A). Historical results from these wells show that 1A is highly contaminated with COD, TOC, total phenol, TOX, and cadmium. Well 3A has periodic high COD, O&G, and total phenol results. Most of the new (CAFO) lacustrine wells (L-14, L-15, L-16, L-19, L-20, L-21, L-26, L-28, L-30, L-33, L-34, and L-35) have been found to have at least some contamination from chromium, total phenols, TOX, 1,2-dichloroethane, MEK, methanol, and/or other organics. Wells L-19, L-20, and L-26 show the highest concentrations of these contaminants. The Task Force recommends that a ground water quality assessment be developed for the lacustrine zone on site, with emphasis on the area around L-19, L-20, and L-26.

(4) Collection pond east of waste pile

The Task Force collected a sample from the above-mentioned pond (sample number MQB-326) and from a stream of liquid flowing to the pond from the waste pile (sample number MQB-306). Task Force sample results were found to contain hazardous waste constituents (see Appendices F and G).

REFERENCES

1. Bentley, M. E., Kent, R. T., and Myers, G. R., "Site Suitability for Waste Injection, Vickery, Ohio," UIPC Symposium 1986, pages 330-354.
2. Bowser-Morner, Inc., "Hydrogeologic Assessment, Northern Ohio Treatment Facility, Vickery, Ohio," May 1983.
3. Bowser-Morner, Inc., "Surface Water Run-on and Run-off Evaluation, Northern Ohio Treatment Facility, Vickery, Ohio," May 1983.
4. Consent Agreement and Final Order, Docket Nos. TSCA-V-C-307 and RCRA-V-C-000, between United States Environmental Protection Agency, Region V, and Chemical Waste Management, Inc., dated April 4, 1985.
5. Golder & Associates, "Assessment of Perimeter Containment Dike Stability, Ponds 4, 5, 7, 11, and 12, Chemical Waste Management, Inc., Liquid Disposal Facility, Vickery, Ohio," June 1983.
6. Golder & Associates, "Continuous Overburden Borehole Sampling Results, Chemical Waste Management, Inc., Vickery, Ohio Facility," May 1985.
7. Golder & Associates, "Evaluation of Potential Borrow Areas, Vickery, Ohio Facility," March 1984.
8. Golder & Associates, "Geotechnical and Geohydrologic Data Review, Vickery, Ohio, Chemical Waste Management Facility," June 1983.
9. Golder & Associates, "Ground Water Monitoring Program, CWM Northern Ohio Treatment Facility, Vickery, Ohio," April 1984.
10. Golder & Associates, "Phase I Ground Water Monitoring Program, Chemical Waste Management, Inc., Vickery, Ohio Facility," March 1986.
11. Golder & Associates, "The Ground Water Program Workplan, Chemical Waste Management, Inc., Vickery, Ohio Facility, May 1985;" Addenda Nos. 1 through 4 dated August 5, August 27, October 17, 1985, and February 11, 1986, respectively.
12. Golder & Associates, "Physical Property Testing of Fixed Material, Chemical Waste Management, Inc., Vickery, Ohio Facility," August 1984.
13. Golder & Associates, "Overburden Ground Water Testing Program, Vickery, Ohio Facility," September 1984.
14. Golder & Associates, "Scaling of Overburden Wells and Dike Piezometers, Vickery Facility," January 1986.

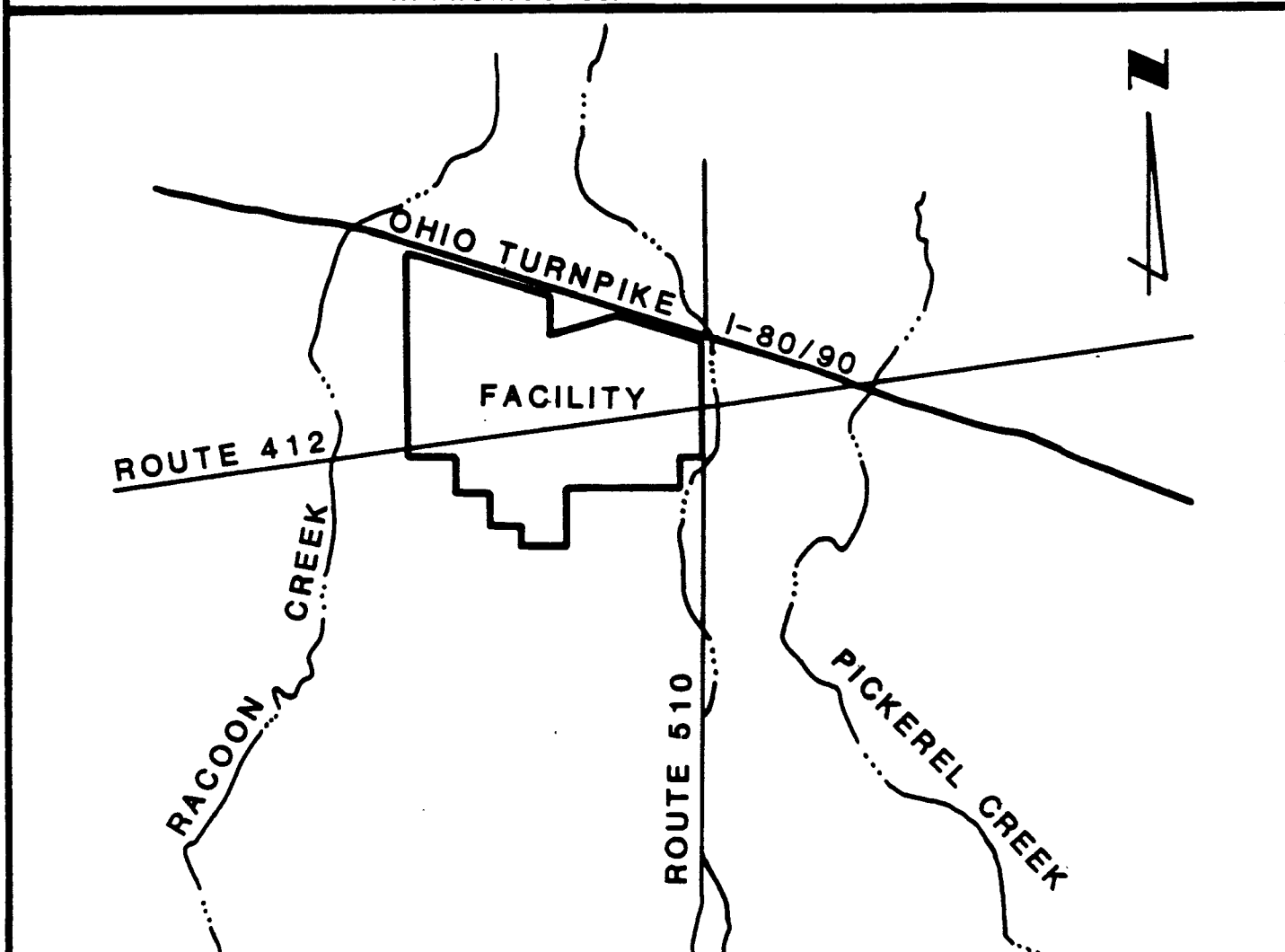
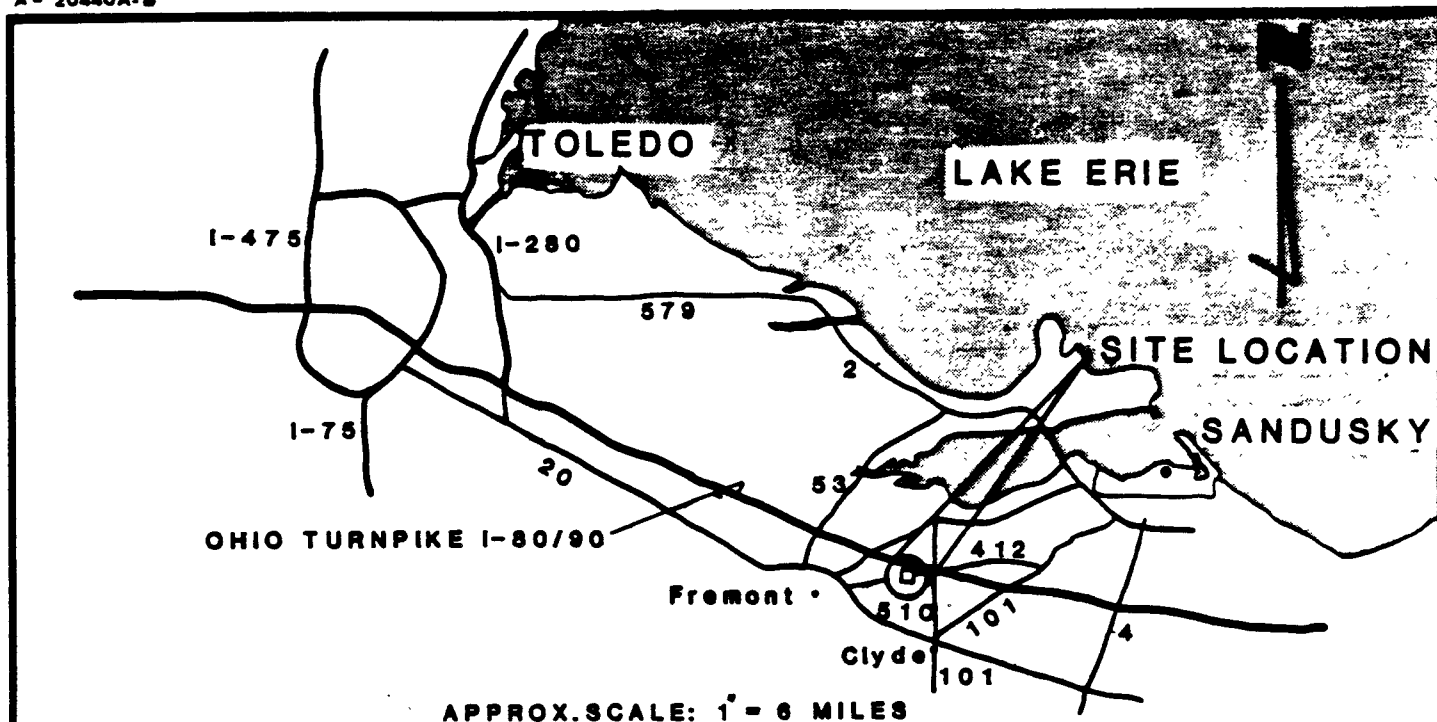
REFERENCES (continued)

15. Golder & Associates, "Stability Analyses of Interior Dikes Between Lagoons 4/5 and 5/7, CWM Northern Ohio Treatment Facility, Vickery, Ohio," March 1984.
16. Golder & Associates, "Stability Analysis of Interior Dikes Between Lagoons 11 and 12, CWM Northern Ohio Treatment Facility, Vickery, Ohio," March 1984.
17. Golder & Associates, "Summary and Characterization of Site Geohydrologic Conditions, Chemical Waste Management, Inc., Vickery, Ohio Facility," September 1983.
18. Golder & Associates, "Surface Water Management Plan, Vickery Facility, Vickery, Ohio," November 1983.
19. Golder & Associates, "Monitoring Program Hydrogeologic Study, Chemical Waste Management, Inc., Vickery, Ohio Facility," July 1986.
20. Hoover, J. A., "Ground Water Resources of Sandusky County, Ohio," Unpublished, University of Toledo Masters Thesis, 1982.
21. Norling, D. L., "Statement concerning ground water conditions in vicinity of Ohio Liquid Disposal, Inc., operations, Riley Township, Sandusky County, Ohio," presented at special meeting of the Ohio Water Pollution Control Board in Fremont, Ohio, August 30, 1972, by Ranney Water Systems, Columbus, Ohio, 1972.
22. Underground Resource Management, Inc., "Evaluation of a Subsurface Waste Injection System near Vickery, Ohio," Consultant Report, 169 pgs., 1984.
23. Versar, Inc., "Comprehensive Monitoring Evaluation," Chemical Waste Management, Inc., Vickery, Ohio, September 30, 1987.
24. Waste Management, Inc., "Manual for Ground Water Sampling," Waste Management, Inc., Oak Brook, Illinois, 1985.
25. Waste Management, Inc., "Site-Specific Ground Water Monitoring Plan for Chemical Waste Management, Inc., Vickery Facility, Vickery, Ohio," Waste Management, Inc., Oak Brook, Illinois, March 1987.
26. Witherspoon, P. A. and Neuman, S. P., "Hydrodynamics of Fluid Injection," in T. D. Cook, edition, Underground Waste Management and Environmental Implications, American Association Petroleum Geologist Memoir 18, pages 258-272, 1972.

REFERENCES (continued)

27. United States Environmental Protection Agency, RCRA Ground Water Monitoring Technical Enforcement Guidance Document (TEGD), September 1986.
28. United States Environmental Protection Agency, Hazardous Waste Ground Water Task Force Protocol for Ground Water Evaluation (HWGWTF Protocol), Hazardous Waste Ground Water Task Force, September 1986.
29. United States Environmental Protection Agency, Characterization of Hazardous Waste Sites - A Method Manual: Volume II. Available Sampling Methods, Second Edition (see Appendix C), December 1984.
30. United States Environmental Protection Agency, Region V, "Quality Assurance Project Plan - Ground Water Monitoring Evaluation, Chemical Waste Management, Inc., Vickery, Ohio Facility," April 1987.
31. Chemical Waste Management, Inc., Submission to Maynard (OEPA) and Constantelos (USEPA), March 6, 1984.
32. Golder and Associates, Appendix II, Closure Cell Design, Phase 2 of Closure Plan for Ponds No. 4, 5, and 7, Chemical Waste Inc., Vickery, Ohio Facility, April 1985.

FIGURES



JOB NO. 834-1358	SCALE NO SCALE	Figure 1 - Site Location Plan for Chemical Waste Management, Vickery Facility, taken from Golder & Assoc., 1986.
DRAWN JLW	DATE 3/13/86	
CHECKED <i>W.D.D.</i>	DWG. NO. 391	
Golder Associates		CHEMICAL WASTE MANAGEMENT, INC. FIGURE 1

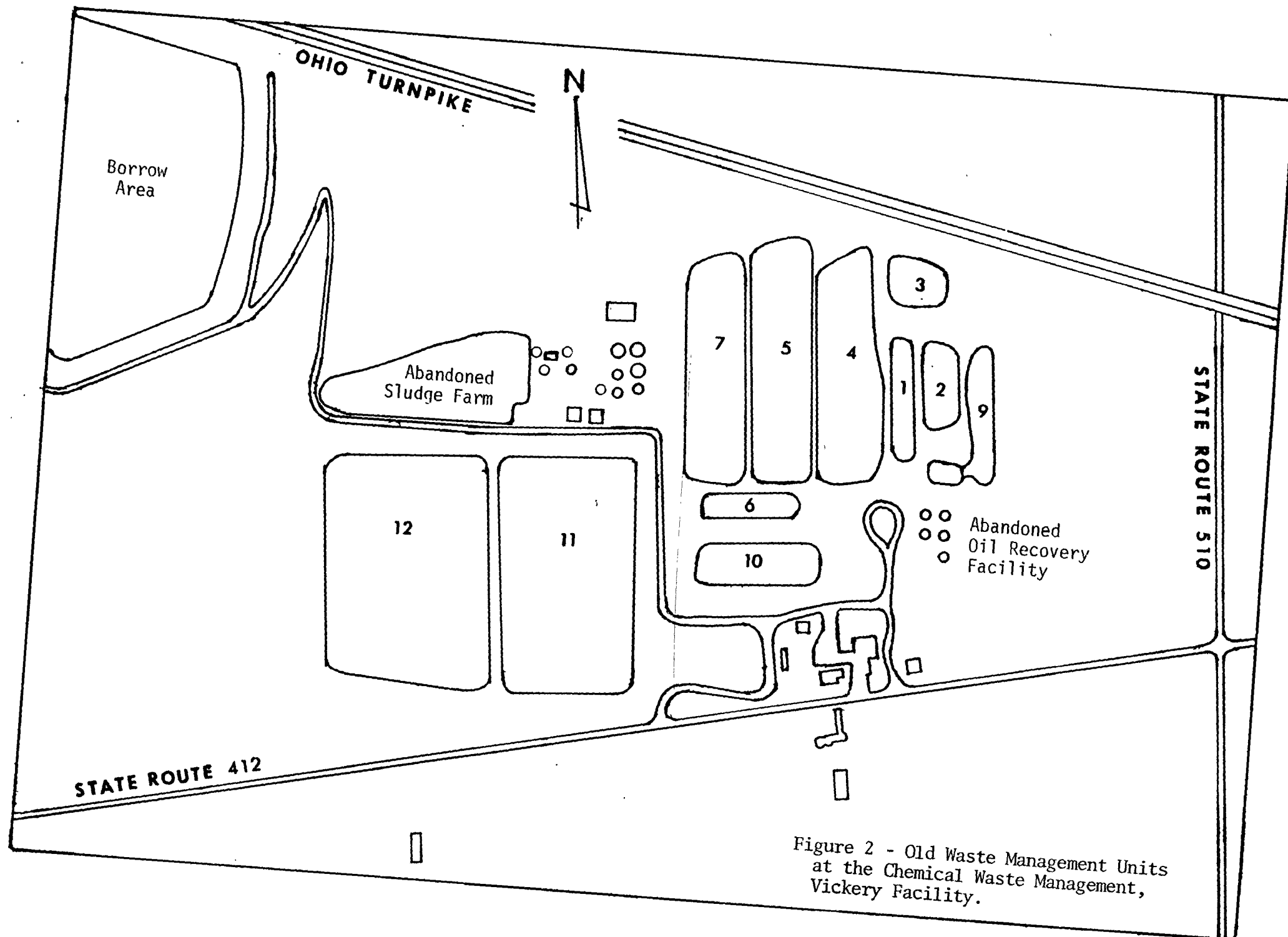


Figure 2 - Old Waste Management Units at the Chemical Waste Management, Vickery Facility.

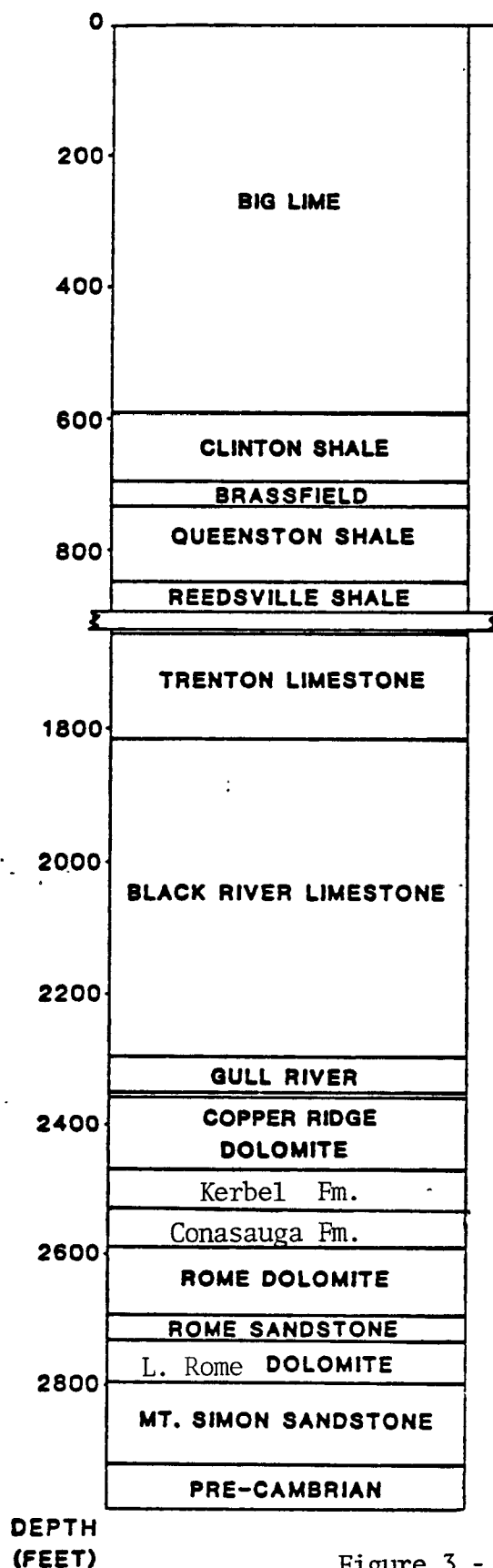


Figure 3 - Stratigraphic Units beneath the Chemical Waste Management Vickery Facility.

CROSS-SECTION OF A WELL

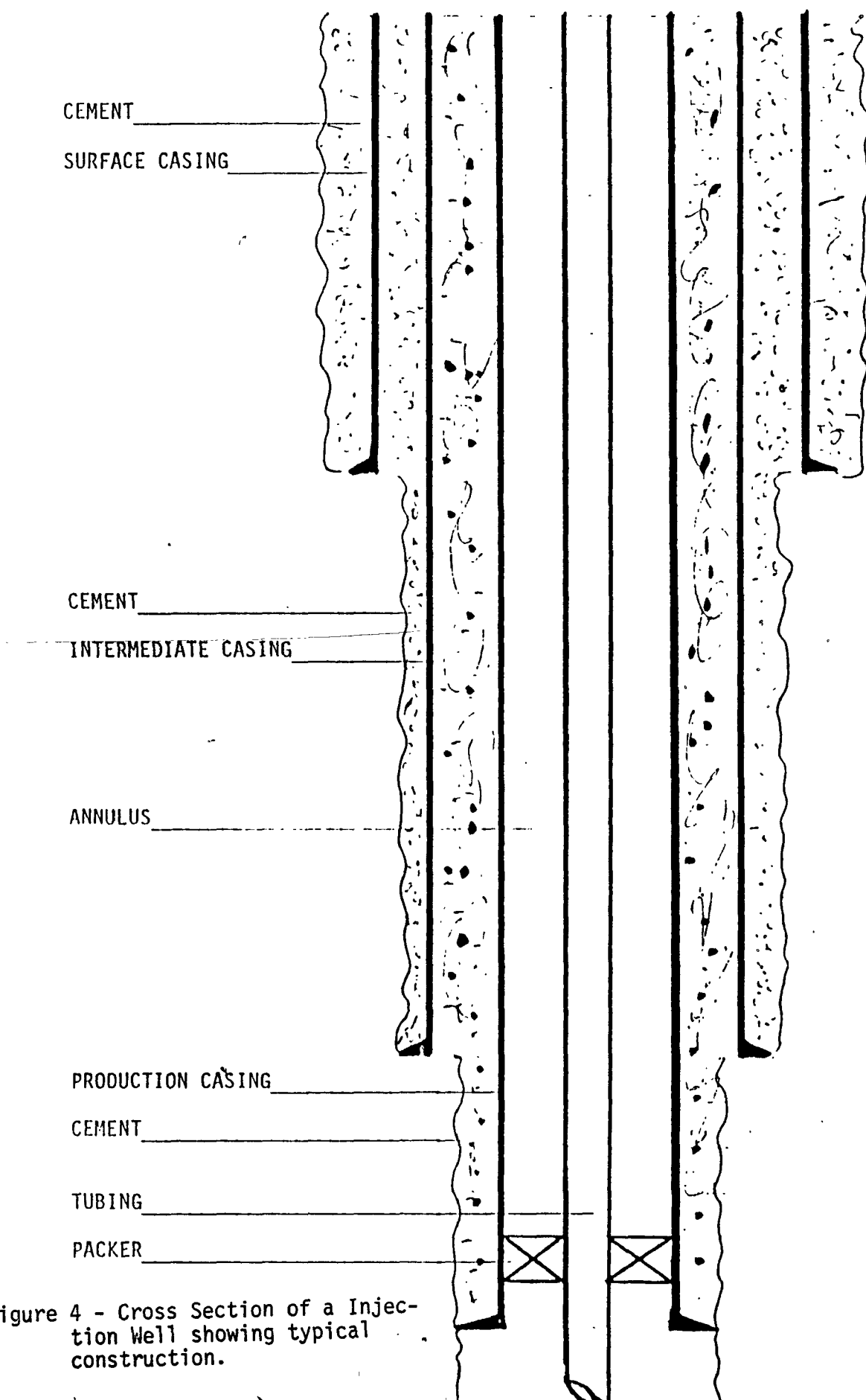


Figure 4 - Cross Section of a Injection Well showing typical construction.

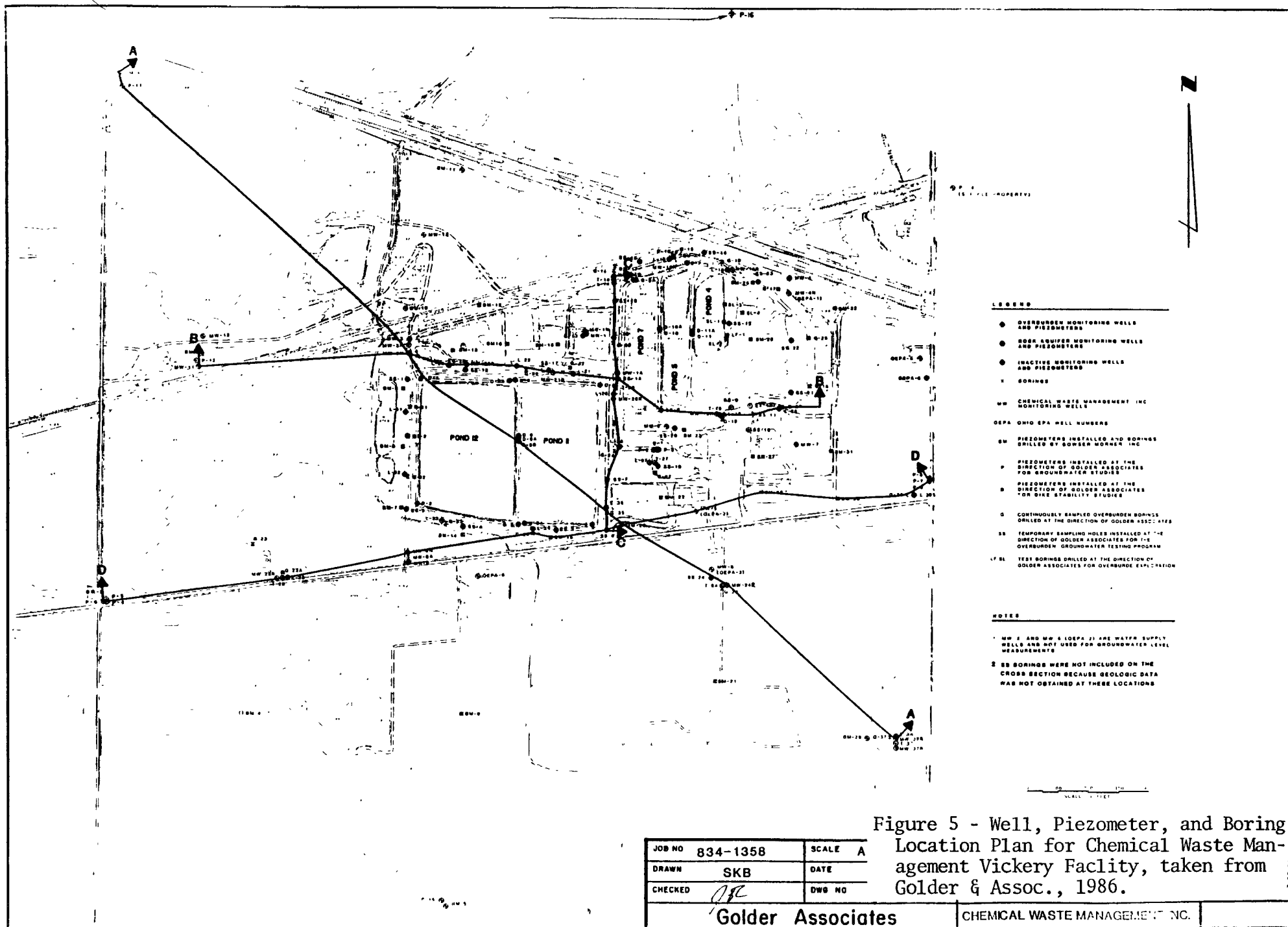
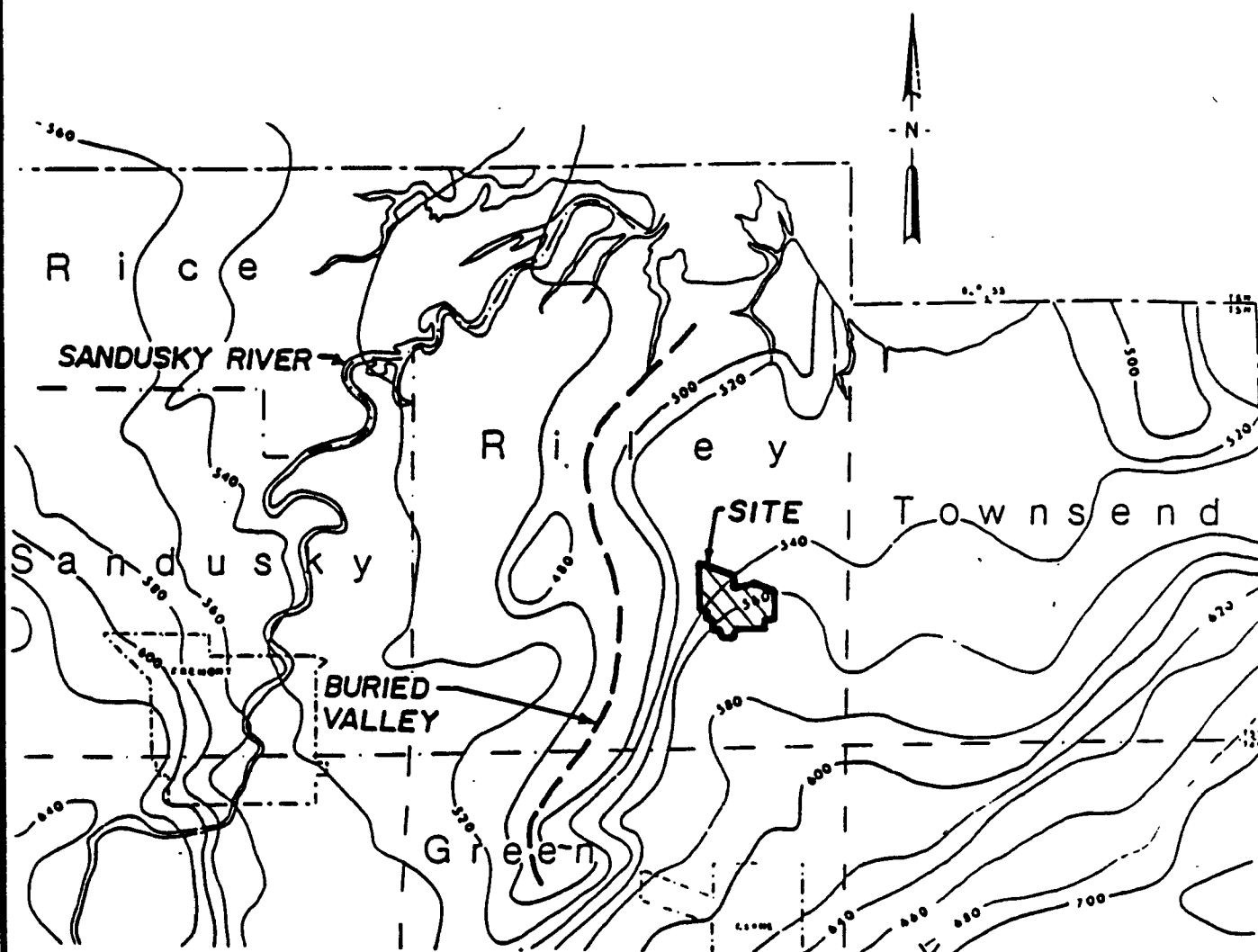


Figure 5 - Well, Piezometer, and Boring Location Plan for Chemical Waste Management Vickery Facility, taken from Golder & Assoc., 1986.



Ref. Taken from Bowser-Morner Report (Reference 2)
(from HOOVER 1982)

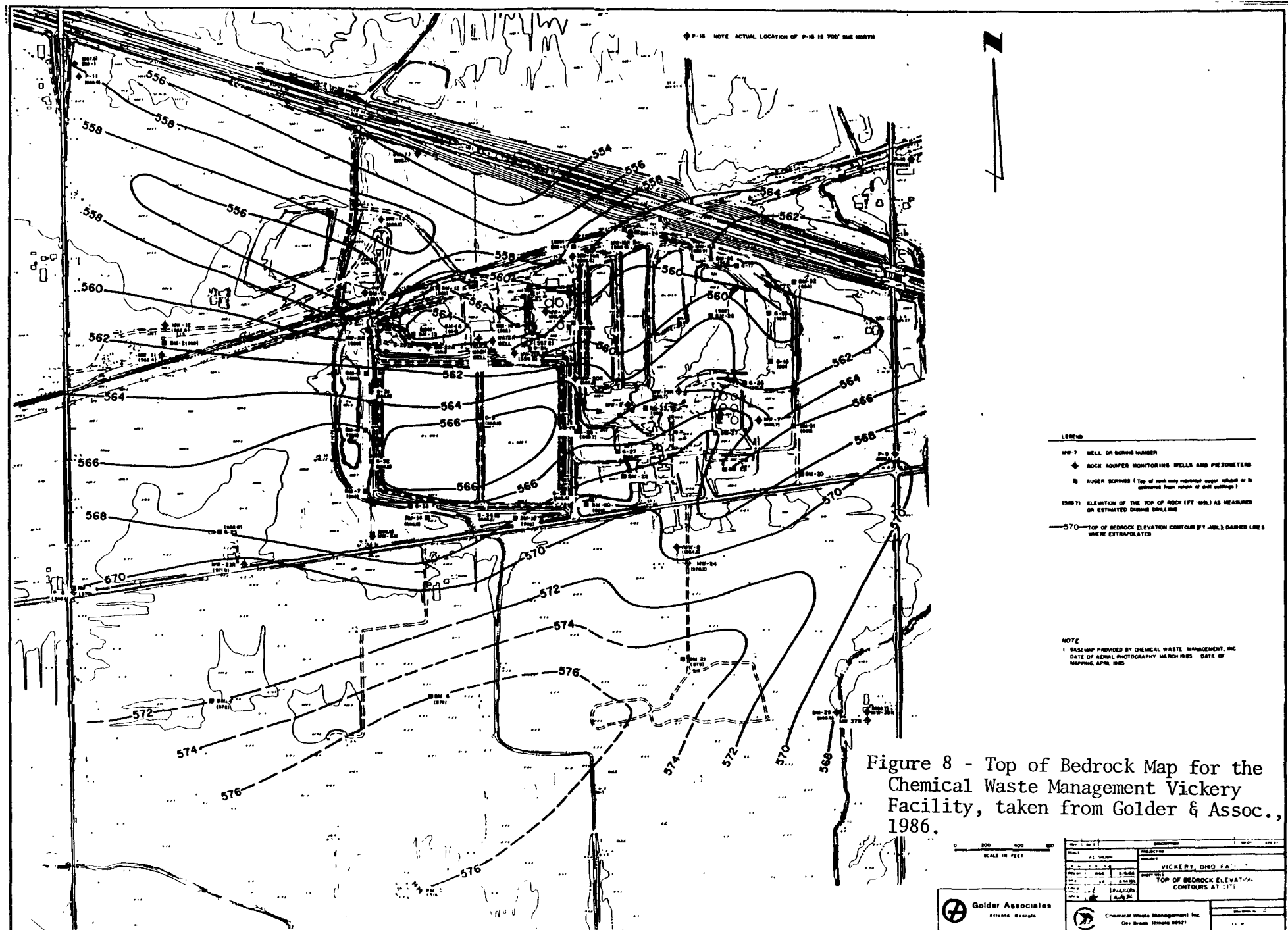
JOB NO.	834-1358	SCALE	1"-12,500 Approx.
DRAWN	SKB	DATE	5/14/86
CHECKED	<i>JFL</i>	DWG. NO.	402

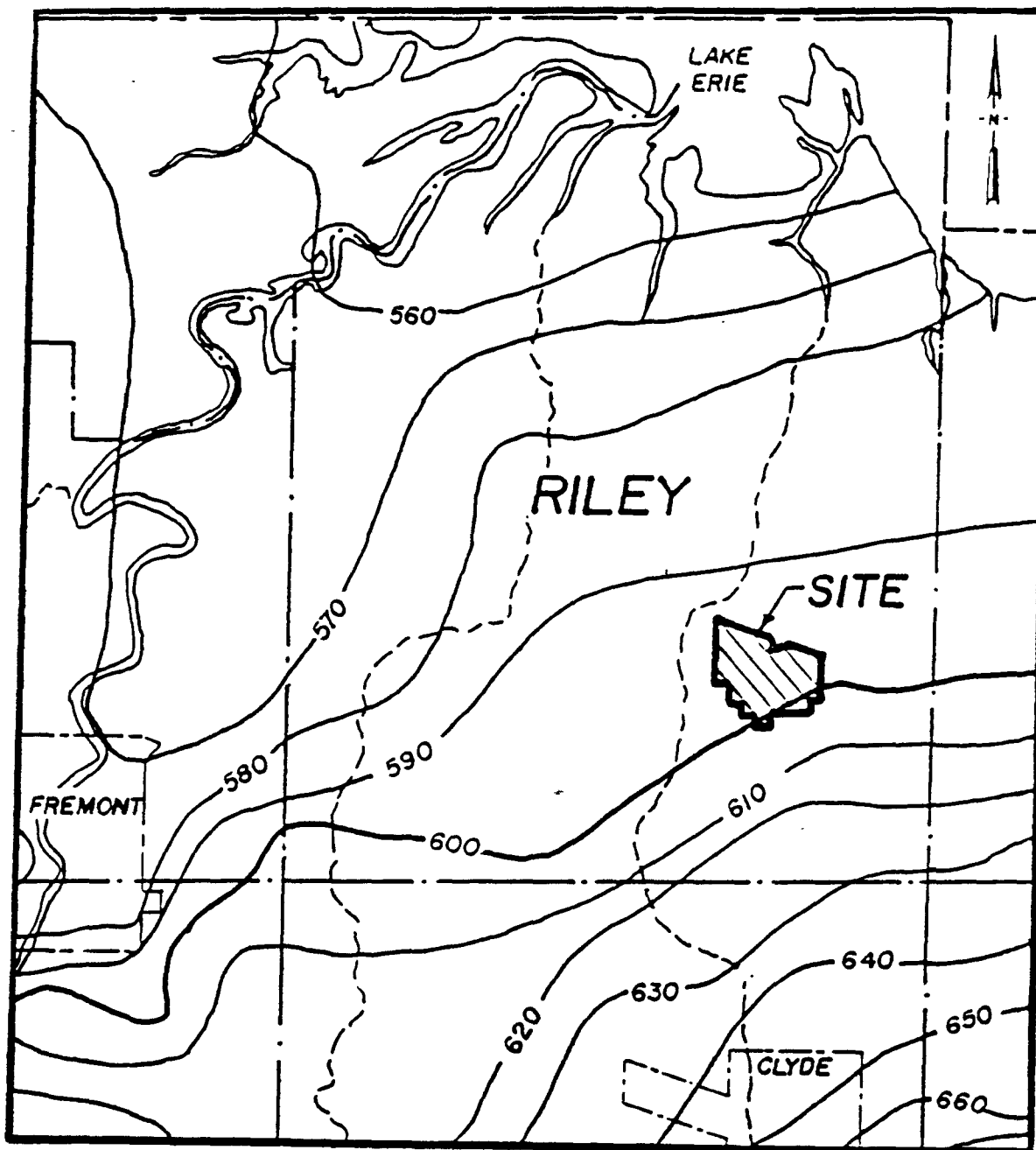
Figure 7 - Regional Top of Bedrock
Map, taken from Hoover, 1982.

Golder Associates

CHEMICAL WASTE MANAGEMENT, INC.

FIGURE





MAP TAKEN FROM BOWSER - MORNER REPORT (Ref.2)

LEGEND

— 610 — GROUNDWATER SURFACE
CONTOUR LINE

JOB NO	834 - 1358	SCALE	1" = 8250' (Approx.)
DRAWN	SKB	DATE	8-3-83
CHECKED	<i>[Signature]</i>	DWG NO	43

Figure 9 - Regional Potentiometric
Map for the Bedrock, taken
from Bowser Morner, 1983.

Golder Associates

CHEMICAL WASTE MANAGEMENT, INC

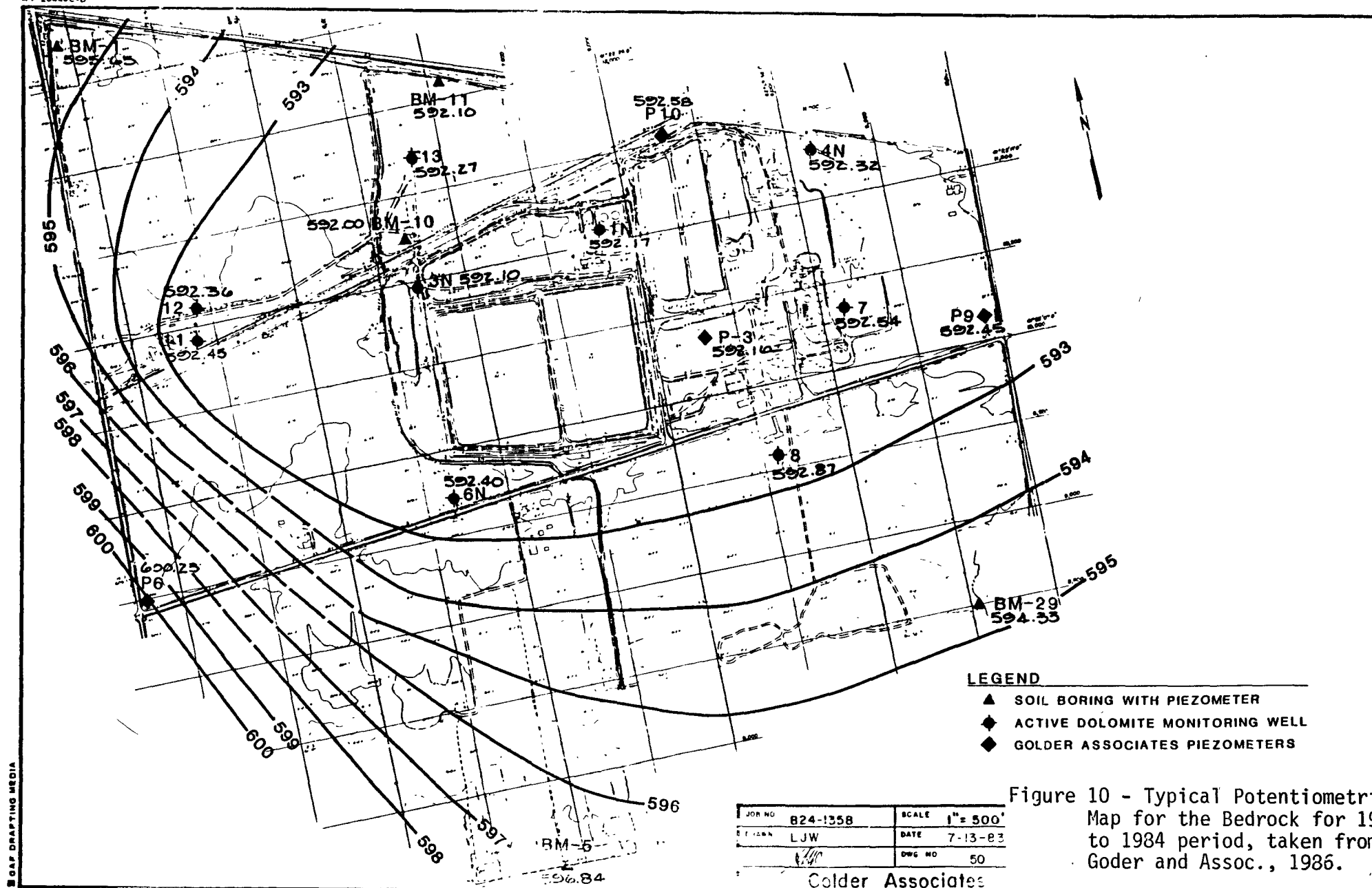


Figure 10 - Typical Potentiometric Map for the Bedrock for 1982 to 1984 period, taken from Goder and Assoc., 1986.

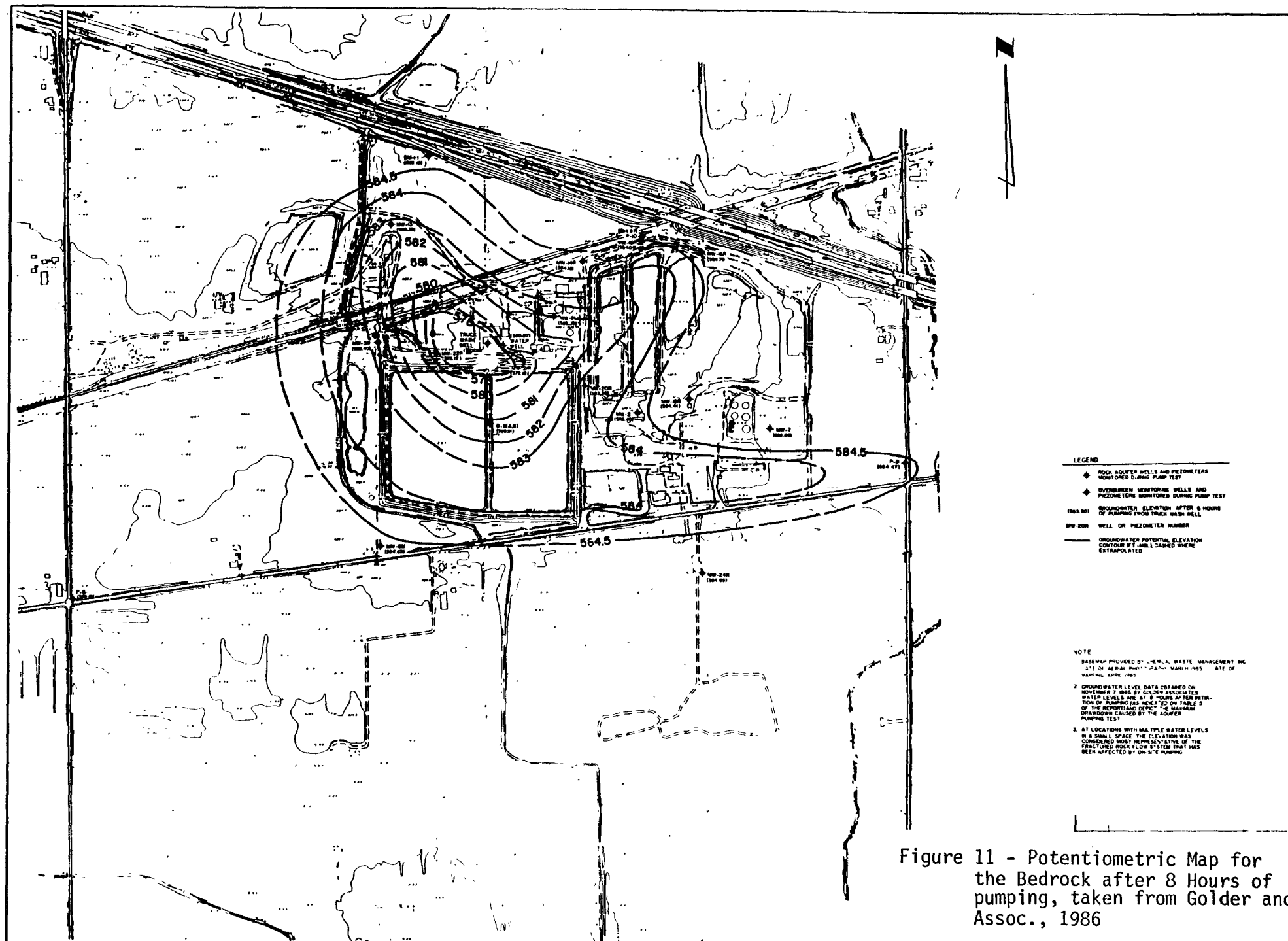
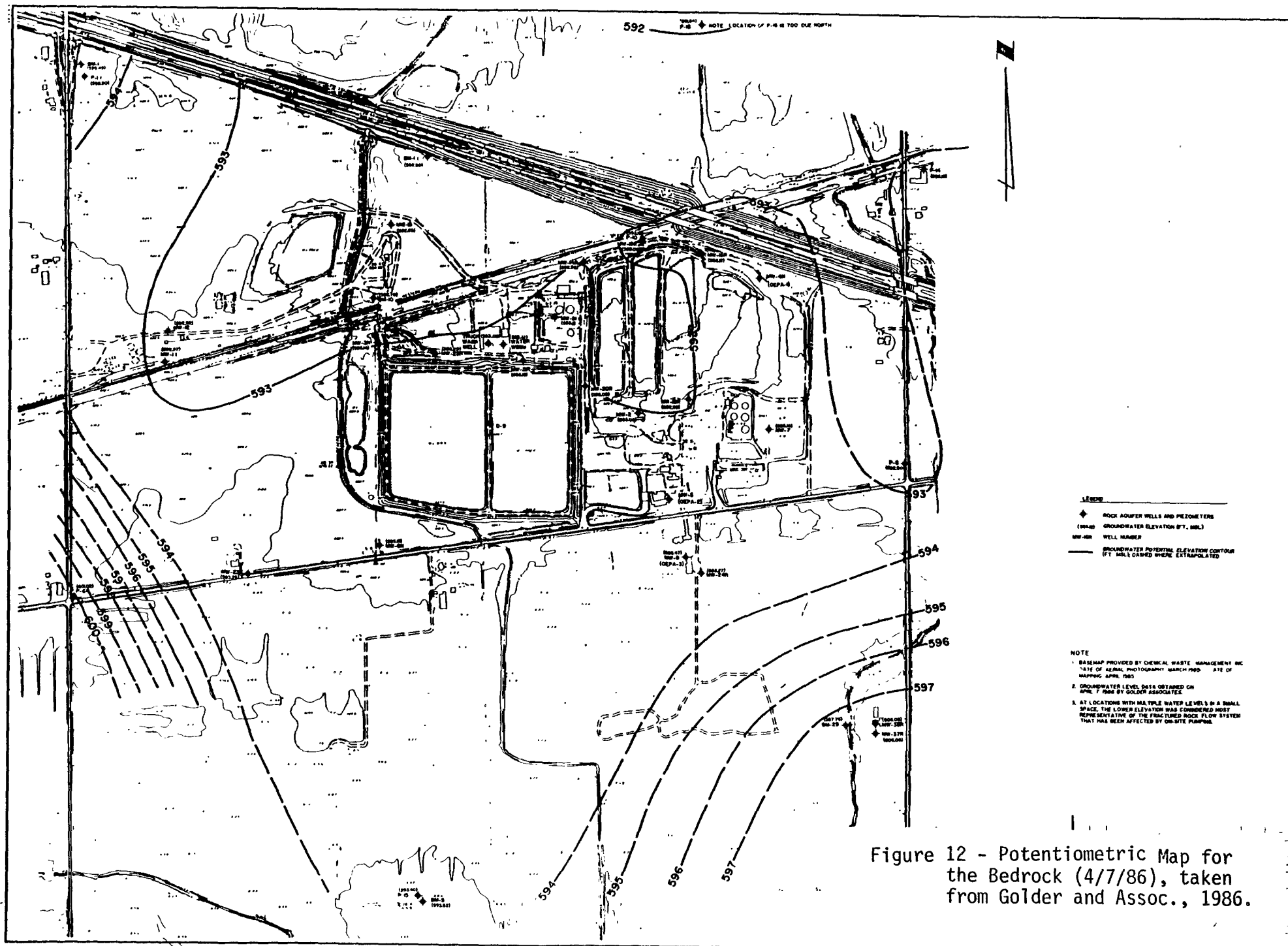
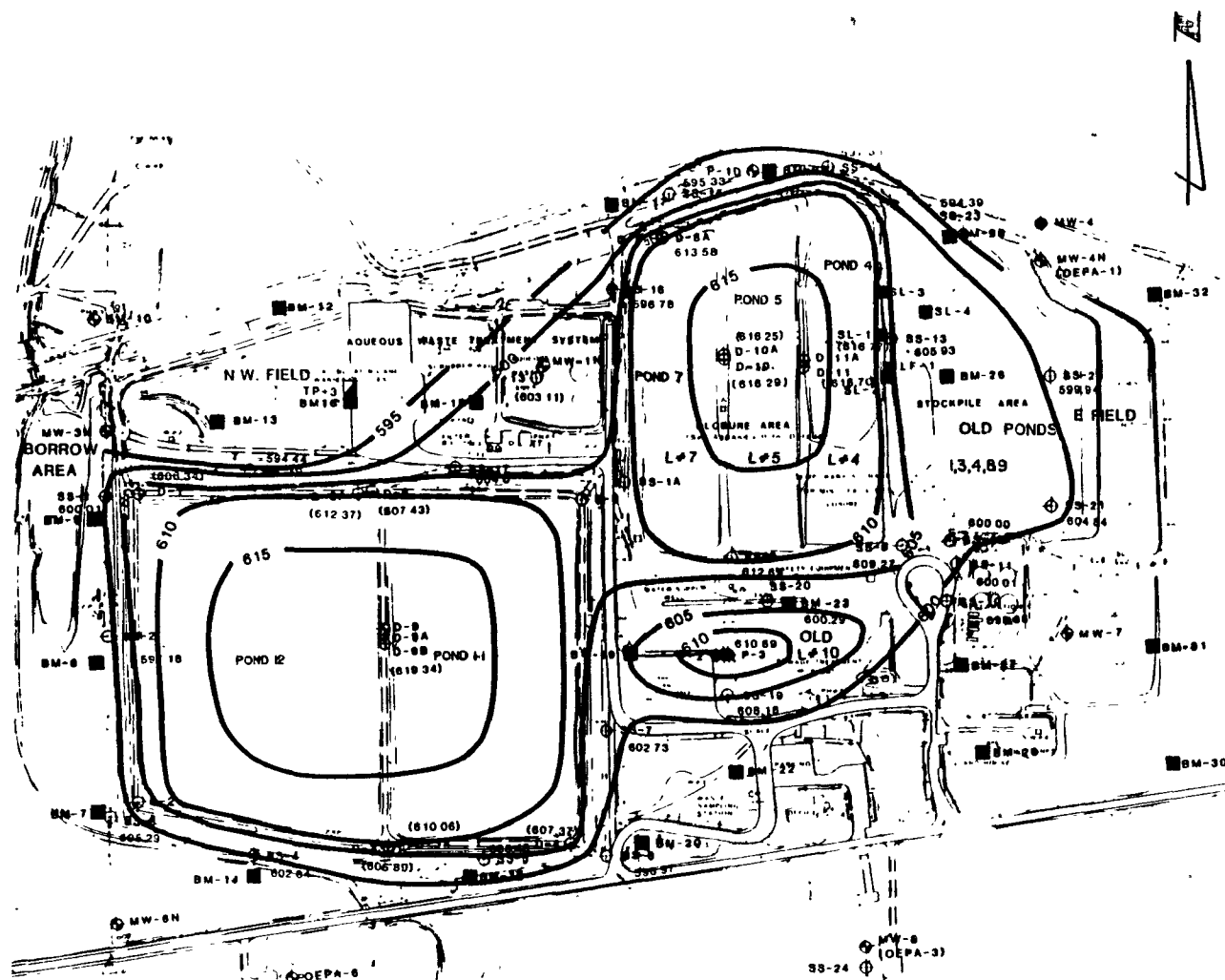


Figure 11 - Potentiometric Map for the Bedrock after 8 Hours of pumping, taken from Golder and Assoc., 1986





LEGEND

- TEST PIT LOCATION
- ⊕ OVERBURDEN MONITORING WELLS AND PIEZOMETERS
- ⊕ ROCK AQUIFER MONITORING WELLS AND PIEZOMETERS
- INACTIVE MONITORING WELLS AND PIEZOMETERS
- BORINGS
- MW CHEMICAL WASTE MANAGEMENT, INC. MONITORING WELLS
- OEPA OHIO EPA WELL NUMBERS
- BM PIEZOMETERS INSTALLED AND BORINGS DRILLED BY BOWSER MORNER, INC.
- P PIEZOMETERS INSTALLED AT THE DIRECTION OF GOLDER ASSOCIATES FOR GROUNDWATER STUDIES
- D PIEZOMETERS INSTALLED AT THE DIRECTION OF GOLDER ASSOCIATES FOR DIKE STABILITY STUDIES
- ⊕ SS-13
606.93 — WATER LEVEL

NOTE:

BORINGS, PIEZOMETERS, AND MONITORING WELLS SHOWN ARE THOSE WHICH WERE INSTALLED PRIOR TO JULY 1984.

WATER LEVELS SHOWN IN PARENTHESIS OBTAINED BY GOLDER ASSOCIATES ON 6/26/84

WATER LEVELS NOT SHOWN IN PARENTHESIS OBTAINED BY GOLDER ASSOCIATES FROM AUGUST 9, 1984 TO AUGUST 13, 1984, EXCEPT FOR SS-21, OBTAINED ON JULY 13, 1984

JOB NO	834-1358	SCALE	AS SHOWN
DRAWN	SKB	DATE	5/7/86
CHECKED	<i>[Signature]</i>	DATE	407

Golder

SHALLOW GROUNDWATER LEVEL CONTOUR PLOT

Figure 13 - Potentionmetric Map for
Glacial Overburden (6/84-8/84)
Taken from Golder and Assoc.,
1986.

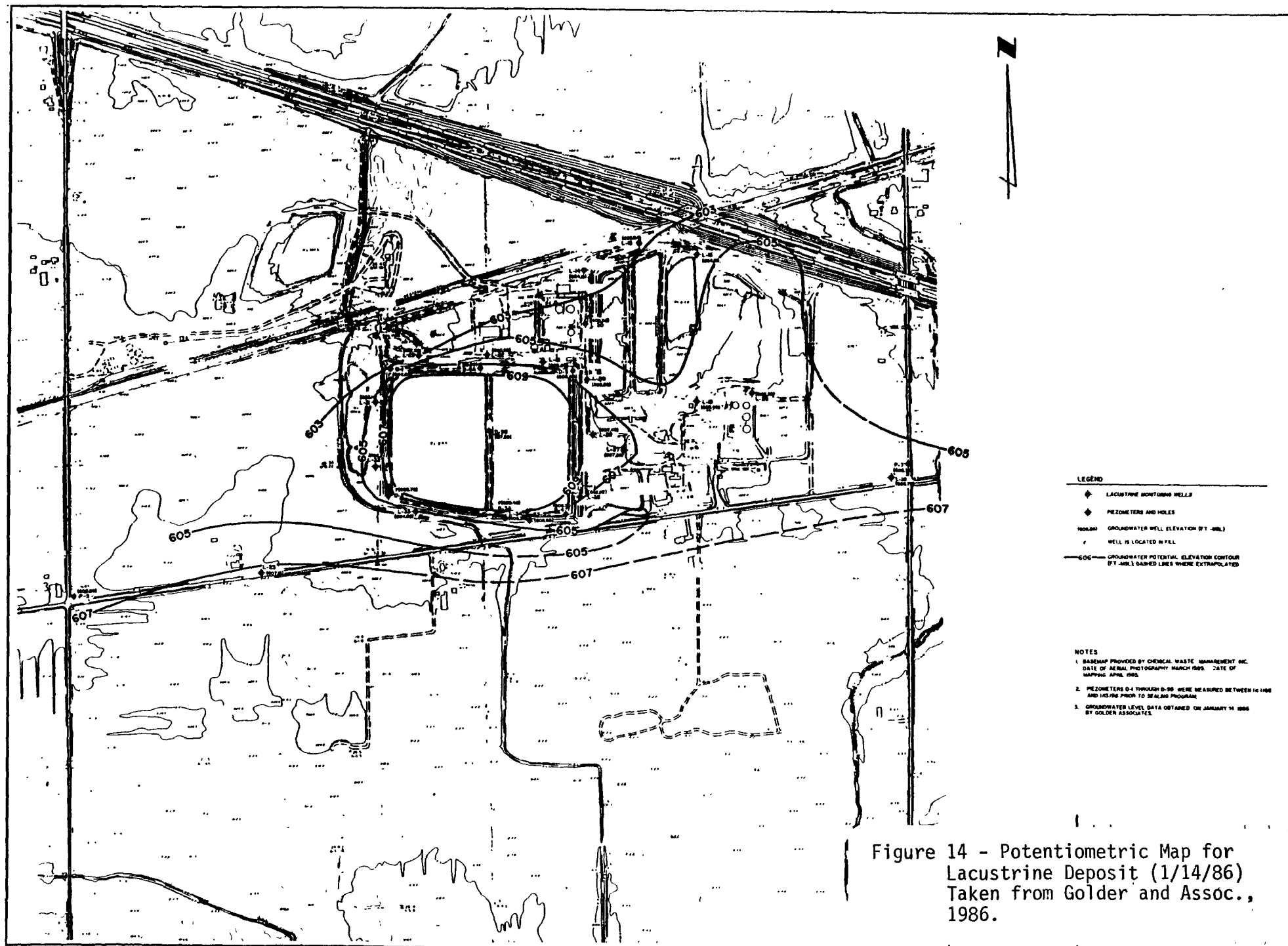


Figure 14 - Potentiometric Map for Lacustrine Deposit (1/14/86) Taken from Golder and Assoc., 1986.

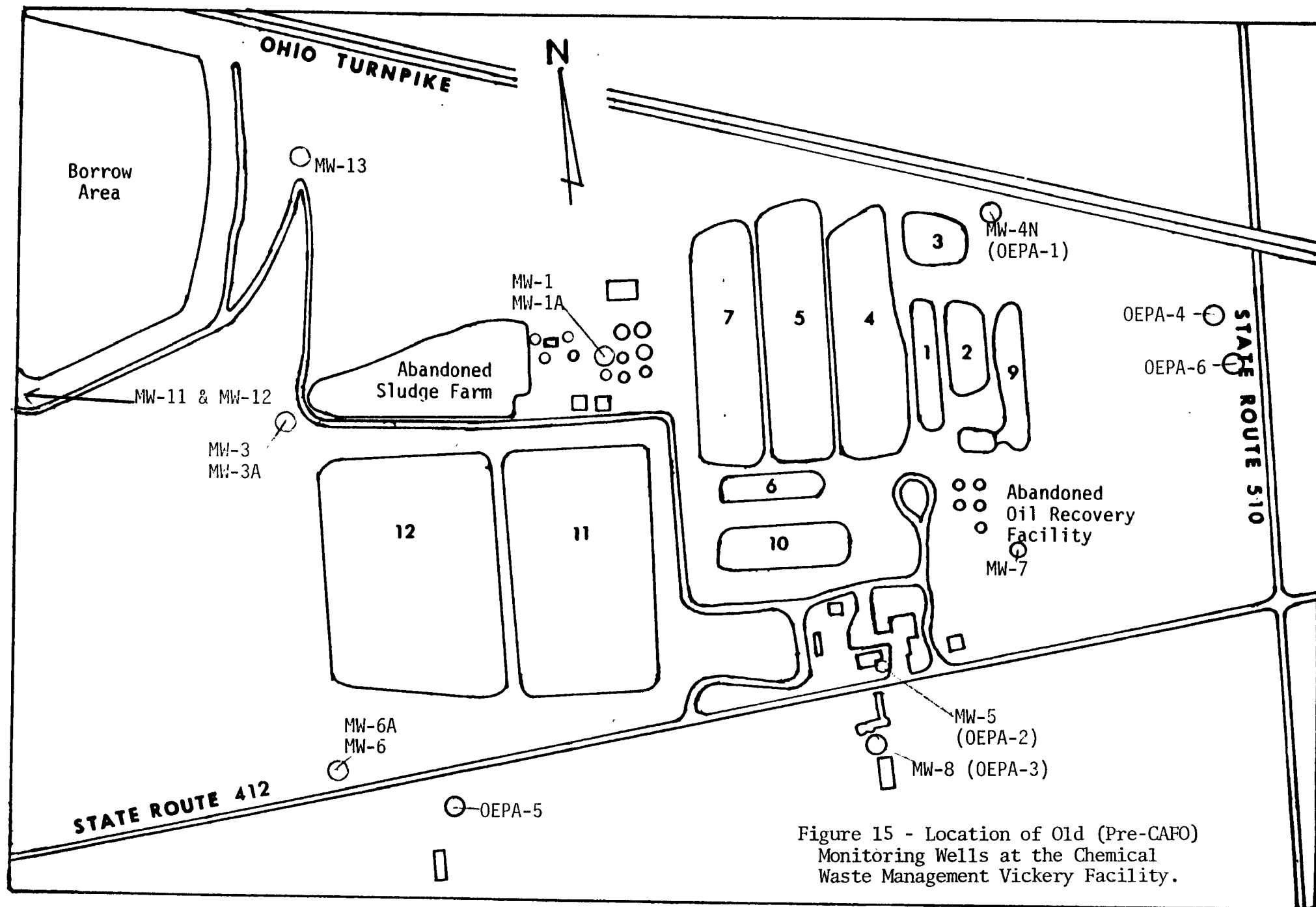


Figure 15 - Location of Old (Pre-CAFO) Monitoring Wells at the Chemical Waste Management Vickery Facility.

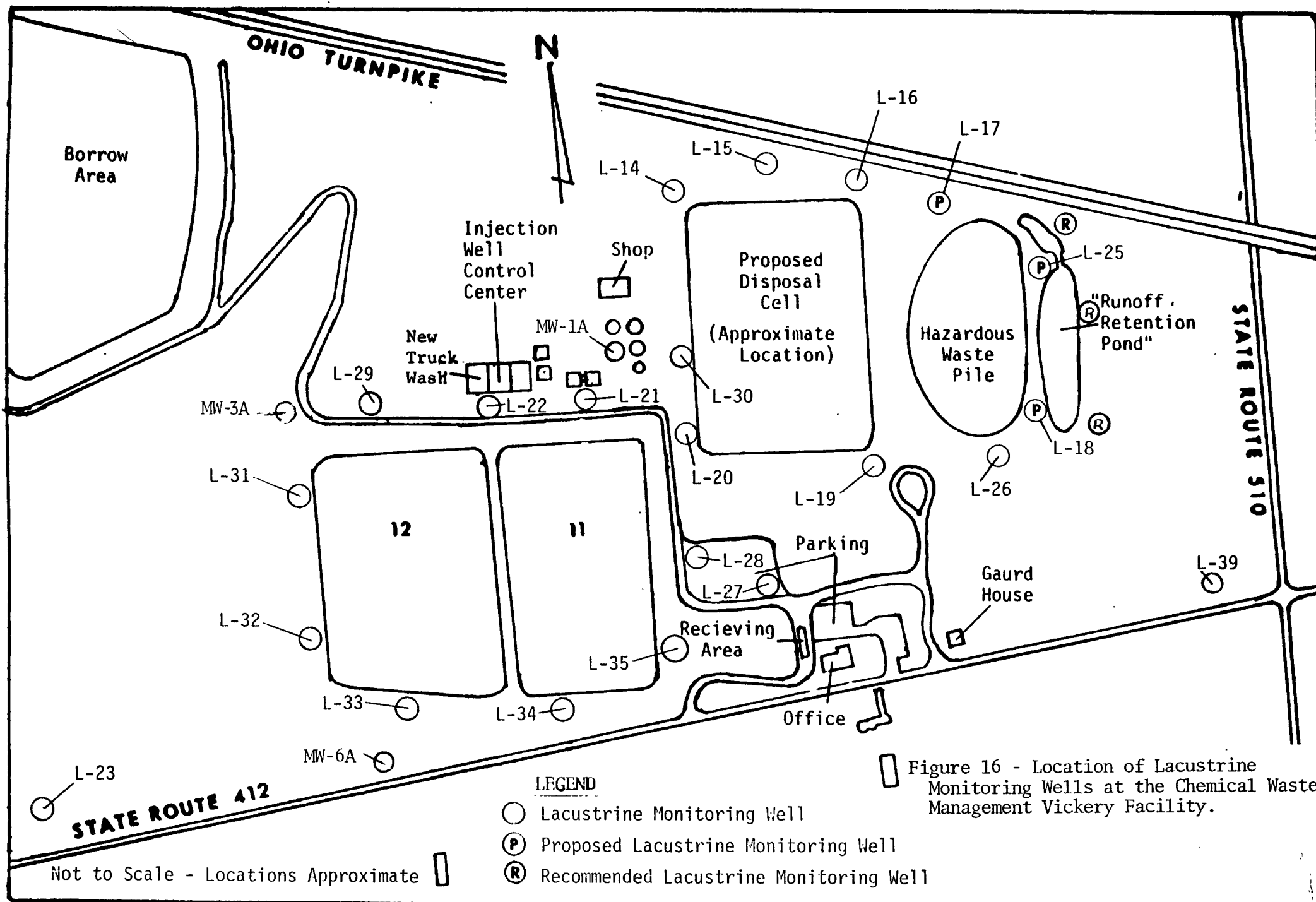


Figure 16 - Location of Lacustrine Monitoring Wells at the Chemical Waste Management Vickery Facility.

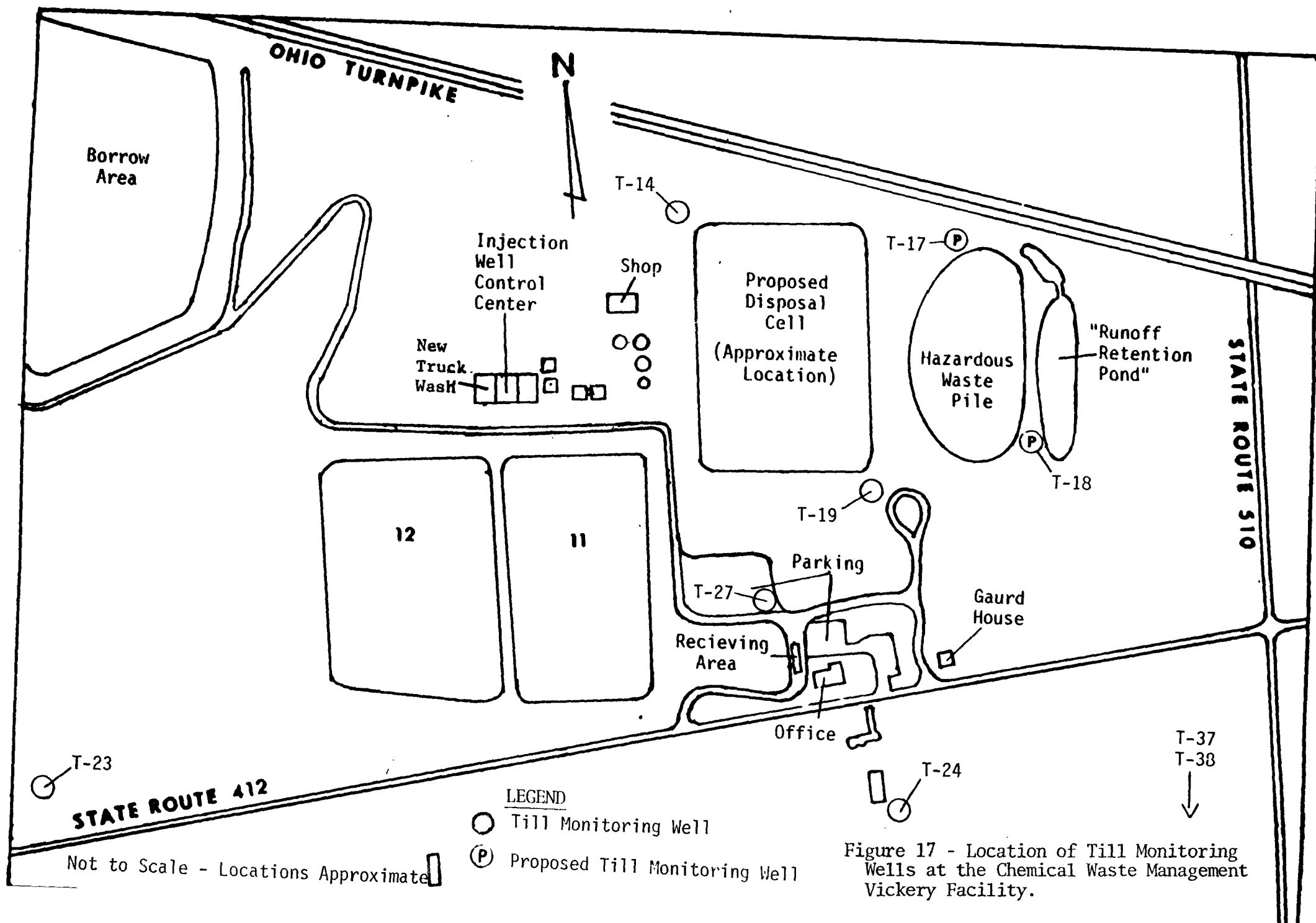


Figure 17 - Location of Till Monitoring Wells at the Chemical Waste Management Vickery Facility.

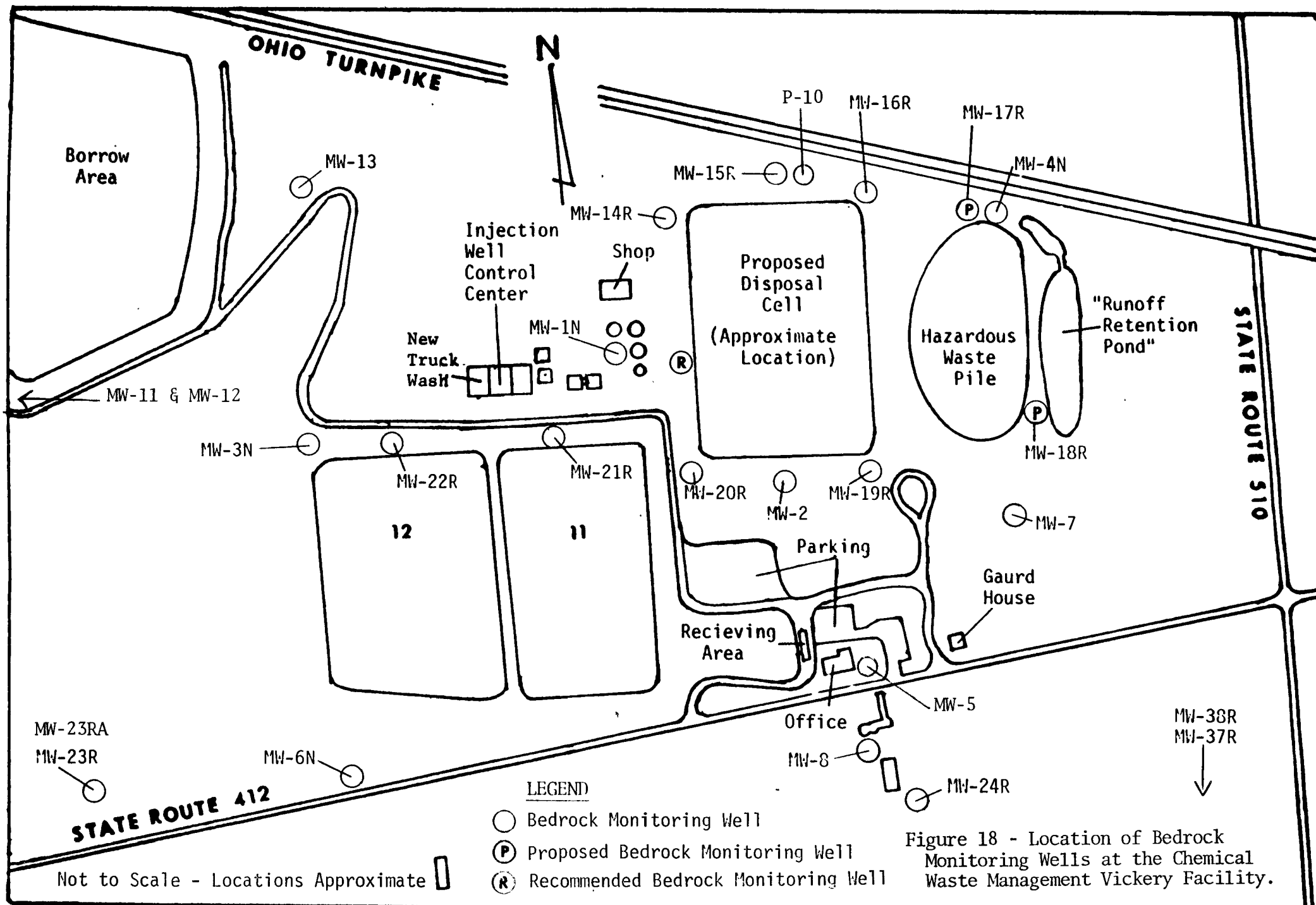


Figure 18 - Location of Bedrock Monitoring Wells at the Chemical Waste Management Vickery Facility.

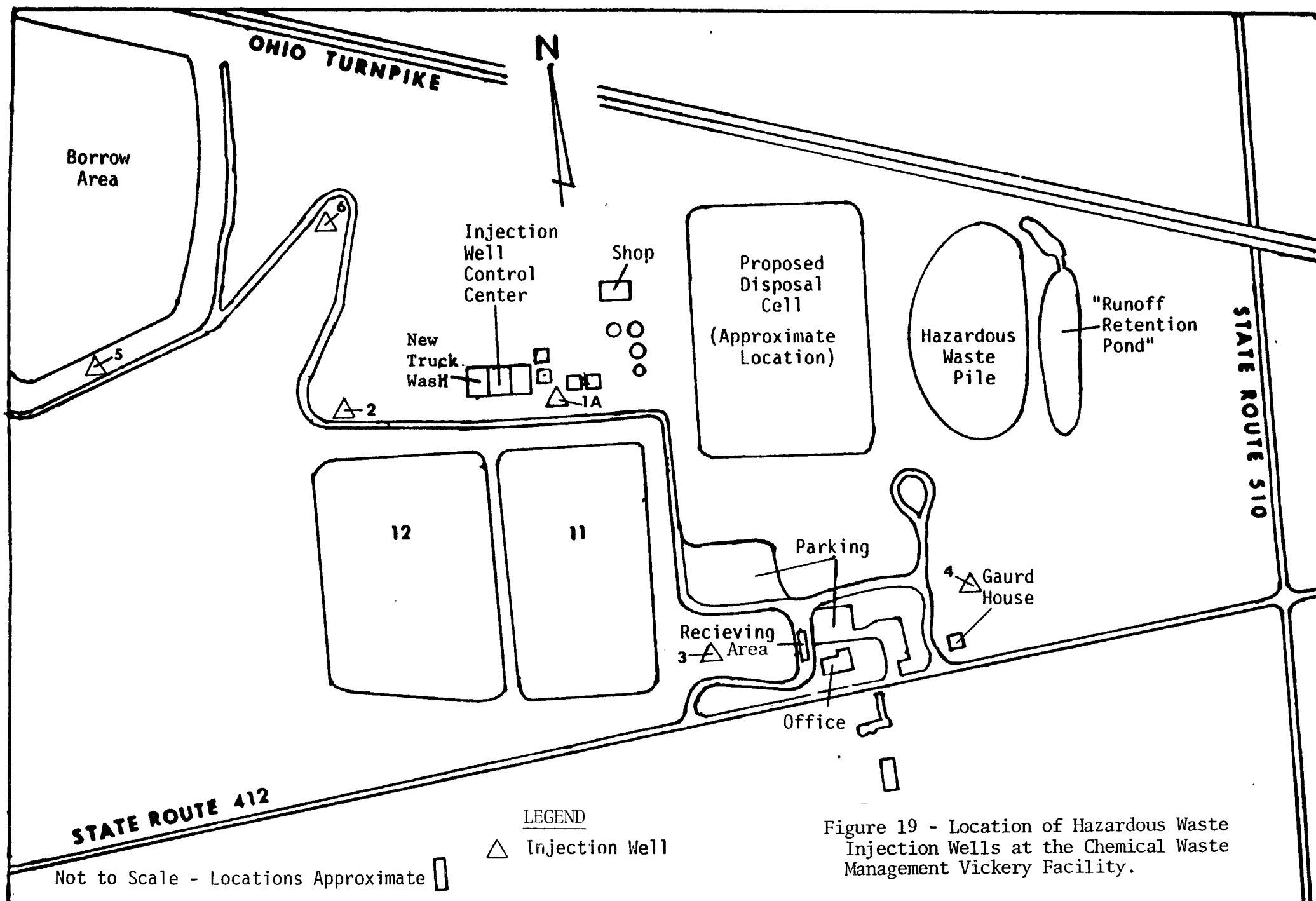


Figure 19 - Location of Hazardous Waste Injection Wells at the Chemical Waste Management Vickery Facility.

TABLES

TABLE 1
CHEMICAL WASTE MANAGEMENT, VICKERY FACILITY

GROUNDWATER ELEVATIONS LACUSTRINE WELLS				
WELL NUMBER	TOP OF CASING ELEVATIONS (FEET, MSL)	WATER ELEVATIONS (3/30/87) (FEET, MSL)	WATER ELEVATIONS (4/07/86) (FEET, MSL)	WATER ELEVATIONS (1/14/86) (FEET, MSL)
L-14	607.92	604.78	NA	604.15
L-15	608.87	605.28	NA	603.04
L-16	612.70	605.73	NA	604.51
L-19	617.87	608.77	NA	606.4
L-20	614.04	608.94	NA	606.56
L-21	612.08	607.56	NA	606.09
L-22	610.73	606.21	NA	605.90
L-23	613.49	609.19	NA	607.18
L-26	612.41	608.36	NA	606.39
L-27	613.70	608.95	NA	607.26
L-28	613.40	609.06	NA	607.43
L-29	609.65	603.79	NA	602.96
L-30	610.84	606.22	NA	603.86
L-31	611.32	605.89	NA	605.14
L-32	611.78	606.73	NA	606.21
L-33	612.41	604.30	NA	604.82
L-34	612.59	606.35	NA	606.30
L-35	612.15	607.59	NA	606.82
L-39	613.28	609.48	NA	606.79

NA - Data not available

DECEMBER 1, 1987

TABLE 2

CHEMICAL WASTE MANAGEMENT, VICKERY FACILITY

GROUNDWATER ELEVATIONS
TILL WELLS

WELL NUMBER	TOP OF CASING ELEVATIONS (FEET, MSL)	WATER ELEVATIONS (3/30/87) (FEET, MSL)	WATER ELEVATIONS (4/07/86) (FEET, MSL)	WATER ELEVATIONS (1/14/86) (FEET, MSL)
T-14	609.84	603.67	NA	597.98
T-19	618.04	608.41	NA	606.18
T-23	613.05	604.89	NA	605.79
T-24	615.25	607.42	NA	608.05
T-27	614.86	606.91	NA	606.19
T-37	615.22	612.16	NA	611.45
T-38	614.50	603.41	NA	611.52

NA - Data not available

DECEMBER 1, 1987

TABLE 3

CHEMICAL WASTE MANAGEMENT, VICKERY FACILITY

GROUNDWATER ELEVATIONS
BEDROCK WELLS

WELL NUMBER	TOP OF CASING ELEVATIONS (FEET, MSL)	WATER ELEVATIONS (3/30/87) (FEET, MSL)	WATER ELEVATIONS (4/07/86) (FEET, MSL)	WATER ELEVATIONS (1/14/86) (FEET, MSL)
MW-14R	607.64	593.18	592.98	592.67
MW-15R	607.84	593.35	593.09	592.63
MW-16R	613.76	593.28	593.12	592.73
MW-19R	617.79	593.24	592.99	592.71
MW-20R	614.04	593.26	593.08	592.68
MW-21R	613.10	593.25	593.14	592.70
MW-22R	608.49	593.22	593.23	592.69
MW-23R	612.96	593.17	593.26	592.68
MW-24R	614.04	593.31	593.27	592.84
MW-37R	616.40	605.48	606.06	605.34
MW-38R	617.22	605.51	606.08	605.36

Table 4

653-3620

MONITORING WELL AND PIEZOMETER CONSTRUCTION SUMMARY

CWN WELL NO.	DATE INSTALLED	GROUND SURFACE	TOP OF CASING (ft., msl)	WELL		THICKNESS OF REINFORTE PELLET SEAL (ft.,)	TOP OF NOCK (ft., msl)	CASING TYPE	BOREFILL MATERIAL	FORMATION SCREENED	WELL STATUS	REMARKS
				OPEN INTERVAL (ft., msl)	BOTTOM(1) INTERVAL (ft., msl)							
MU-1N	07-02-79	607.4	609.17	407.0-550.9	407.0	550.9	UNKNOWN	6.0", PVC	BC	NOCK	UNKNOWN	CASED TO 60"
MU-2	1976	620.3(61)	624.09	UNKNOWN	470.3	UNKNOWN	UNKNOWN	4.0" GALV. STEEL	BC	NOCK	UNKNOWN	USED FOR WATER SOURCE
MU-3N	07-03-79	605.3	606.75	553.3-557.3	553.3	557.3	UNKNOWN	6.0", PVC	BC	NOCK	UNKNOWN	
MU-3N	UNKNOWN	604.7	606.37	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	4.0", PVC	BC	L.C.	ACCESSIBLE	CASING REPAIRED 7/16/86 TOP OF CASING 607.53
MU-4N	07-02-79	600.0	600.04	550.0-560.0	550.0	560.0	UNKNOWN	6.0", PVC	BC	NOCK	UNKNOWN	CASED TO 40"
MU-5	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	4.0" GALV. STEEL	BC	NOCK	INACCESSIBLE	LAG WELL
MU-6N	07-02-79	600.5	610.65	550.5-562.5	550.5	562.5	UNKNOWN	6.0", PVC	BC	NOCK	MONITORED	
MU-6N	1976	600.7	600.67	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	4.0", PVC	BC	L.C.	ACCESSIBLE	
MU-7	07-03-79	600.1	610.26	553.1-562.6	553.1	562.6	UNKNOWN	6.0", PVC	BC	NOCK	MONITORED	CASED TO 45.3'
MU-8	06-12-79	611.0	612.00	561.0-564.0	561.0	564.0	UNKNOWN	4.0" GALV. STEEL	BC	NOCK	ACCESSIBLE	CASED TO 47'
MU-11	05-06-81	600.4	609.79	540.4-560.9	540.4	560.9	UNKNOWN	6.0", PVC	BC	NOCK	MONITORED	
MU-12	05-06-81	606.1	600.30	541.1-559.1	541.1	559.1	UNKNOWN	6.0", PVC	BC	NOCK	MONITORED	
MU-13	05-06-81	603.7	605.27	543.7-555.7	543.7	555.7	UNKNOWN	6.0", PVC	BC	NOCK	MONITORED	
MU-14N	10-05-85	606.1	607.63	544.4-557.1	544.4	557.1	9.0	2", 316 SS	B.G.	NOCK	MONITORED	
T-14	10-17-85	605.5	609.04	504.3-591.4	504.3	591.4	4.1	2", 316 SS	B.G.	TILL	MONITORED	SCREENED IN SAND R.O.C.
T-14	10-10-85	606.4	607.92	509.7-599.9	509.7	599.9	4.0	2", 316 SS	B.G.	L.C.	MONITORED	
MU-15N	10-02-85	605.1	607.04	541.1-553.7	541.1	553.7	6.0	2", 316 SS	B.G.	NOCK	MONITORED	
T-15	10-17-85	604.0	600.06	509.6-599.3	509.6	599.3	3.5	2", 316 SS	B.G.	L.C.	MONITORED	
MU-16N	09-24-85	610.6	613.76	544.2-550.3	544.2	550.3	5.3	2", 316 SS	B.G.	NOCK	MONITORED	
T-16	10-17-85	610.2	612.70	536.0-603.7	536.0	603.7	4.0	2", 316 SS	B.G.	L.C.	MONITORED	
MU-17N	-	-	-	-	-	-	-	-	-	-	TO BE DRILLED	
T-17	-	-	-	-	-	-	-	-	-	-	TO BE DRILLED	
T-17(2)	-	-	-	-	-	-	-	-	-	-	TO BE DRILLED	

JULY 1986

Table 4 (cont.)

853-3020

MONITORING WELL AND PIEZOMETER CONSTRUCTION SUMMARY

CAN WELL NO.	DATE INSTALLED	GROUND SURFACE	TOP OF CASING	OPEN INTERVAL (ft., in.)	WELL BOTTOM (1) INTERVAL (ft., in.)	BOTTOM OF SEAL (ft.)	THICKNESS OF BENTONITE PELLET SEAL (ft.)	TOP OF ROCK (ft., in.)	CASING TYPE	BACKFILL MATERIAL	FORMATION SCREENED	WELL STATUS	REMARKS
MW-18R(2)	-	-	-	-	-	-	-	-	-	-	-	TO BE DRILLED	
T-18(2)	-	-	-	-	-	-	-	-	-	-	-	TO BE DRILLED	
L-18(2)	-	-	-	-	-	-	-	-	-	-	-	TO BE DRILLED	
MW-19R	09-11-85	616.1	617.79	546.6-563.7	546.6	563.7	11.4	563.7	2", 316 SS	BG	ROCK	MONITORED	
T-19	10-10-85	616.3	618.04	500.0-596.5	500.0	596.5	4.0	UNKNOWN	2", 316 SS	BG	TILL	MONITORED	
L-19	10-20-85	615.5	617.07	594.6-604.2	594.6	604.2	5.0	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
MW-20R	09-27-85	611.0	614.03	543.0-563.0	543.0	563.0	7.2	563.0	2", 316 SS	BG	ROCK	MONITORED	
L-20	10-21-85	611.2	614.03	595.6-603.4	595.6	603.4	5.0	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
MW-21R	09-11-85	610.3	613.00	542.0-559.0	542.0	559.0	9.2	559.0	2", 316 SS	BG	ROCK	MONITORED	
L-21	10-16-85	609.3	612.07	593.9-603.5	593.9	603.5	4.0	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
MW-22R	09-17-85	606.4	608.46	544.0-561.1	544.0	561.1	10.9	561.1	2", 316 SS	BG	ROCK	MONITORED	
L-22	10-16-85	609.2	610.70	592.0-602.7	592.0	602.7	4.5	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
MW-23R	10-08-85	610.5	612.26	554.5-571.0	554.5	571.0	0.2	571.0	2", 316 SS	BG	ROCK	MONITORED	
T-23	10-17-85	610.0	613.04	502.6-593.5	502.6	593.5	4.3	UNKNOWN	2", 316 SS	BG	TILL	MONITORED	
L-23	10-24-85	610.0	613.30	592.0-602.9	592.0	602.9	5.4	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
MW-24R	09-19-85	612.6	614.04	553.1-570.2	553.1	570.2	9.6	570.2	2", 316 SS	BG	ROCK	MONITORED	
T-24	10-22-85	612.0	615.25	509.5-606.6	509.5	606.6	4.0	UNKNOWN	2", 316 SS	BG	TILL	MONITORED	
L-25(2)	-	-	-	-	-	-	-	-	-	-	LAC.	TO BE DRILLED	
L-26	11-01-85	609.4	612.41	604.4-592.4	591.6	604.6	2.0	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
T-27	10-23-85	612.3	614.05	500.0-591.9	500.0	591.9	3.9	UNKNOWN	2", 316 SS	BG	TILL	MONITORED	SCREENED IN SAND RICH ZONE
L-27	10-29-85	612.2	613.70	593.1-605.9	593.1	605.9	4.1	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
L-28	10-23-85	611.3	613.39	590.3-605.3	590.3	605.3	UNKNOWN	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
L-29	10-31-85	606.4	609.61	509.1-601.1	509.1	601.1	3.3	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	

Taken from Golder & Assoc., 1986

JULY 1986

Table 4 (cont.)

053-3020

MONITORING WELL AND PIEZOMETER CONSTRUCTION SUMMARY

CAN WELL NO.	DATE INSTALLED	GROUND SURFACE	TOP OF CASING	OPEN INTERVAL (ft. msl)	WELL BOTTOM (ft.) INTERVAL (ft. msl)	BOTTOM OF SEAL (ft.)	THICKNESS OF BENTONITE PELLET SEAL (ft.)	TOP OF ROCK (ft. msl)	CASING TYPE	BACKFILL MATERIAL	FORMATION SCREENED	WELL STATUS	REMARKS
L-30	10-20-85	607.6	610.04	595.2-601.0	595.2	601.0	4.0	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
L-31	10-31-85	607.9	611.33	593.1-602.3	593.1	602.3	3.7	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
L-32	10-29-85	608.5	611.00	590.7-603.0	590.7	603.0	3.2	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	SCREENED IN SAND RICH ZONE
L-33	10-20-85	609.6	612.42	596.7-603.3	596.7	603.3	4.0	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
L-34	10-10-85	610.1	612.61	589.5-604.1	589.5	604.1	4.0	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
L-35	10-31-85	608.6	612.19	591.4-603.1	591.4	603.1	3.5	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	
MW-36R(13)	-	-	-	-	-	-	-	-	-	-	-	TO BE DRILLED	
MW-37A	10-15-85	613.2	616.40	551.2-563.6	551.2	563.6	2.7	566.7	2", 316 SS	BG	ROCK	MONITORED	
T-37	10-20-85	612.9	615.22	589.6-605.6	589.6	605.6	4.0	UNKNOWN	2", 316 SS	BG	TILL	MONITORED	
MW-38A	11-12-85	613.7	617.22	551.6-563.7	551.6	563.7	4.0	567.2	2.0", PVC	BG	ROCK	MONITORED	COMPARATIVE STUDY MONITORING WELL
T-38	11-14-85	613.6	614.50	590.4-606.5	590.4	606.5	4.7	UNKNOWN	2.0", PVC	BG	TILL	MONITORED	COMPARATIVE STUDY MONITORING WELL
L-39	11-17-85	610.0	613.20	602.0-606.6	602.0	606.6	2.3	UNKNOWN	2", 316 SS	BG	LAC.	MONITORED	SCREEN INTERVAL IN SAND LENSE
BM-1	10-14-82	601.3	603.04	537.3-557.3	537.3	557.3	14.0	557.3	1.25", PVC	B/CEMENT	ROCK	ACCESSABLE	
BM-5	10-14-82	616.5	615.19	536.0-576.0	536.0	576.0	N/A	576.0	1.25", PVC	B/CEMENT	ROCK	ACCESSABLE	NO BENT. SEAL
BM-10	11-16-82	604.2	605.90	544.2-554.2	544.2	554.2	N/A	554.7	1.25", PVC	B/CEMENT	ROCK	ACCESSABLE	NO BENT. SEAL
BM-11	10-06-82	600.9	602.35	549.9-555.9	549.9	555.9	2.0	552.9	1.25", PVC	B/CEMENT	ROCK	ACCESSABLE	
BM-29	10-19-82	610.3	612.60	546.3-566.3	546.3	566.3	N/A	567.0	1.25", PVC	B/CEMENT	ROCK	ACCESSABLE	NO BENT. SEAL
P-4	04-29-83	609.1	611.49	576.1-582.0	576.1	582.0	N/A	UNKNOWN	2.0", PVC	B/CEMENT	TILL	ACCESSABLE	NO BENT. SEAL
P-5	04-28-83	609.3	610.64	595.3-605.0	595.3	605.0	N/A	UNKNOWN	2.0", PVC	B/CEMENT	LAC.	ACCESSABLE	NO BENT. SEAL
P-6	05-16-83	609.3	611.30	531.3-546.0	531.3	546.0	N/A	UNKNOWN	2.0", PVC	B/CEMENT	ROCK	ACCESSABLE	NO BENT. SEAL
P-7	04-29-83	609.9	611.00	597.9-605.0	597.9	605.0	N/A	UNKNOWN	2.0", PVC	B/CEMENT	LAC.	ACCESSABLE	

Taken from Golder & Assoc., 1986

JULY 1986

Table 4 (cont.)

613-3629

MONITORING WELL AND PIEZOMETER CONSTRUCTION SUMMARY

C&M WELL NO.	DATE INSTALLED	GROUND SURFACE	TOP OF CASING	WELL		THICKNESS OF BENTONITE PELLET SEAL (ft.)	TOP OF ROCK (ft. msl)	CASING TYPE	BACKFILL MATERIAL	FORMATION SCREENED	WELL STATUS	REMARKS
				OPEN INTERVAL (ft. msl)	BOTTOM OF SEAL (ft.)							
P-8	04-29-83	609.7	611.73	574.7-582.0	574.7	582.0	UNKNOWN	2.0", PVC	8/CEMENT	TILL	ACCESSIBLE	
P-9	05-10-83	609.9	611.40	538.4-542.0	538.4	542.0	N/A	2.0", PVC	8/CEMENT	ROCK	ACCESSIBLE	
P-10	05-06-83	604.9	606.00	517.4-531.0	517.4	531.0	N/A	2.0", PVC	8/CEMENT	ROCK	ACCESSIBLE	
P-11	10-01-83	601.6	604.12	544.1-556.0	544.1	556.0	3.5(15)	2.0", PVC	8/CEMENT	ROCK	ACCESSIBLE	
P-12	10-03-83	608.3	610.00	504.3-592.3	504.3	592.3	UNKNOWN	2.0", PVC	UNKNOWN	LAC.	UNKNOWN	
P-14	09-29-83	604.0	607.31	541.0-553.0	541.0	553.0	3.0(15)	2.0", PVC	8/CEMENT	ROCK	ACCESSIBLE	
P-15	09-30-83	616.3	618.83	563.0-574.2	563.0	574.2	3.0(15)	2.0", PVC	8/CEMENT	ROCK	ACCESSIBLE	
P-16	01-12-86	601.0	602.62	539.3-551.4	539.3	551.4	1.9	2.0", PVC	80	ROCK	ACCESSIBLE	
SS-9	07-12-84	612.0	614.27	500.0-593.0	500.0	593.0	2.1	2.0", PVC	86/CEMENT LAC/TILL	TILL	TO BE SEALED	BURIED
SS-10	07-10-84	610.0	610.13	504.5-593.7	504.5	593.7	2.0	2.0", PVC	86/CEMENT LAC/TILL	TILL	TO BE SEALED	BURIED
SS-11	07-11-84	610.0	612.40	500.0-593.0	500.0	593.0	2.5	2.0", PVC	86/CEMENT LAC/TILL	TILL	TO BE SEALED	BURIED
SS-12	07-10-84	610.0	613.70	500.0-593.0	500.0	593.0	2.0	2.0", PVC	86/CEMENT LAC/TILL	TILL	TO BE SEALED	BURIED

Taken from Golder & Assoc., 1986

Table 5

SITE: Vickery (490)

WELL ID CHART

DATE: 11/14/86

WELL ID #	ACTIVE OR CLOSED	PURPOSE	GRADIENT	DEPTH OF WELL (feet)	ELEVATION AT TOP OF CASING (msl)	NORMAL RANGE						COMMENTS
						PURGE VOLUME (gallons)	DEPTH TO WATER (feet)	RECHARGE TIME (hrs)	TEMP. (°C)	pH (Std)	SPECIFIC CONDUCT. (umhos) at 25°C	
L14	A	CAFO and TSCA	Lateral		607.92	2.2-2.4	4.29-4.34	48 hours	10.8-15.0	6.70-7.12	4100-4300	Low yield 1 casing volume
L15	A	CAFO and TSCA	Lateral		608.87	2.1-2.5	3.60-4.90	> 3 days	11.0-14.0	6.80-7.00	4700-7500	Low yield 1 casing volume
L16	A	CAFO and TSCA	Lateral		612.70	1.1-2.6	6.95-7.86	> 3 days	11.1-13.7	6.69-6.94	4700-7000	Low yield 1 casing volume
L19	A	CAFO and TSCA	Lateral		617.87	2.1-2.5	8.62-10.33	48 hours	13.3-13.5	6.50-6.90	6000-7700	Low yield 1 casing volume
L20	A	CAFO and TSCA	Lateral		614.04	1.9-2.2	5.23-6.45	36 hours	12°-14.8	6.60-6.90	8000-8500	Low yield 1 casing volume
L21	A	CAFO only	Lateral		612.08	1.7-2.0	5.00-7.00	24 hours	9-13°	6.70-6.90	3800-3900	Low yield 1 casing volume
L22	A	CAFO only	Lateral		610.73	2.1-2.4	3.30-4.90	36 hours	8-15°	6.90-7.25	2900-3500	Low yield 1 casing volume
L23	C											Plugged abandoned on 10/9/86
L23A	A	CAFO and TSCA	Lateral		613.49	2.0-2.7	4.00-5.00	< 3 days	10-13°	7.30-7.50	1300-1400	*Low yield well 1 casing. Volume purge.
L26	A	CAFO and TSCA	Lateral		612.41	6.1-7.2	5.00-7.30	< 12 hours	13-16°	6.70-7.10	3990-5100	*High yield 3 casing volume purge
L27	A	CAFO and TSCA	Lateral		613.70	2.4-3.0	4.55-5.30	24 hours	9-13°	7.10-7.70	1000-1500	*Low yield well 1 casing volume purge
L28	A	CAFO and TSCA	Lateral		613.40	6.0-7.5	4.66-7.59	< 16 hours	10-15°	6.50-6.70	6000-6500	*High yield well 3 casing. Volume purge.
L29	A	CAFO only	Lateral		609.65	4.6-5.4	5.79-7.59	< 16 hours	9-15°	7.00-7.40	1000-1500	*High yield well 3 casing. Volume purge.

Table 5 (cont.)

SITE: Vickery (490)

WELL ID CHART

DATE: 11/14/86

[illegible]

WELL ID CHART

DATE: 11/14/86

[illegible]

Table 5 (cont.)

SITE: Vickery (490)

WELL ID CHART

DATE: 11/14/86

WELL ID #	ACTIVE OR CLOSED	PURPOSE	GRADIENT	DEPTH OF WELL (feet)	ELEVATION AT TOP OF CASING (msl)	NORMAL RANGE						COMMENTS
						PURGE VOLUME (gallons)	DEPTH TO WATER (feet)	RECHARGE TIME (hrs)	TEMP. (°C)	pH (Std)	SPECIFIC CONDUCT. (umhos) at 25°C	
T14	A	CAFO and TSCA	Lateral		609.84	3.1-3.3	7.0-9.9	3 days	11-12°	7.29- 7.37	1900- 2100	Low yield well 1 cas- ing volume
T19	A	CAFO and TSCA	Lateral		618.04	12-13	9.9-11.1	8 hours	11-13°	7.29- 7.64	*10,400- 1280	Well wizard high yield 3 casing volume
T23	C											Plugged and abandoned on 10/9/86
T23A	A	CAFO and TSCA	Lateral		613.05	@ 1 gallon	24.9	3 days	11.9	7.13	1720	Low yield well-1 cas- ing volume
T24	A	CAFO only	Lateral		615.25	3.2-4.0	6.6-6.7	2 days	9.9- 12.0	7.19- 7.24	2050- 2100	Replaces T23 Low yield well
T27	A	CAFO and TSCA	Lateral		614.86	4.0-5.0	8.0-8.7	3 days	11.7- 13.1	7.10- 7.80	1200- 9800	Low yield well
T37	A	CAFO	Lateral		615.22	3.7-3.9	3.49-4.00	3 days	12.2- 12.5	7.10- 7.22	2500- 2900	Low yield well
T38	A	PVC well CWM Research	Lateral		614.50	3.5-3.7	2.37-2.84	3 days	10.0- 12.5	7.10- 7.22	2500- 2900	Low yield well

*10,400 was back in April, well is still being developed by sampling.

Table 5

SITE: Vickery (490)

WELL ID CHART

DATE: 11/14/86

WELL ID #	ACTIVE OR CLOSED	PURPOSE	GRADIENT	DEPTH OF WELL (feet)	ELEVATION AT TOP OF CASING (msl)	NORMAL RANGE						COMMENTS
						PURGE VOLUME (gallons)	DEPTH TO WATER (feet)	RECHARGE TIME (hrs)	TEMP. (°C)	pH (Std)	SPECIFIC CONDUCT. (umhos) at 25°C	
L14	A	CAFO and TSCA	Lateral		607.92	2.2-2.4	4.29-4.34	48 hours	10.8-15.0	6.70-7.12	4100-4300	Low yield 1 casing volume
L15	A	CAFO and TSCA	Lateral		608.87	2.1-2.5	3.60-4.90	> 3 days	11.0-14.0	6.80-7.00	4700-7500	Low yield 1 casing volume
L16	A	CAFO and TSCA	Lateral		612.70	1.1-2.6	6.95-7.86	> 3 days	11.1-13.7	6.69-6.94	4700-7000	Low yield 1 casing volume
L19	A	CAFO and TSCA	Lateral		617.87	2.1-2.5	8.62-10.33	48 hours	13.3-13.5	6.50-6.90	6000-7700	Low yield 1 casing volume
L20	A	CAFO and TSCA	Lateral		614.04	1.9-2.2	5.23-6.45	36 hours	12°-14.8	6.60-6.90	8000-8500	Low yield 1 casing volume
L21	A	CAFO only	Lateral		612.08	1.7-2.0	5.00-7.00	24 hours	9-13°	6.70-6.90	3800-3900	Low yield 1 casing volume
L22	A	CAFO only	Lateral		610.73	2.1-2.4	3.30-4.90	36 hours	8-15°	6.90-7.25	2900-3500	Low yield 1 casing volume
L23	C											Plugged abandoned on 10/9/86
L23A	A	CAFO and TSCA	Lateral		613.49	2.0-2.7	4.00-5.00	< 3 days	10-13°	7.30-7.50	1300-1400	*Low yield well 1 casing. Volume purge.
L26	A	CAFO and TSCA	Lateral		612.41	6.1-7.2	5.00-7.30	< 12 hours	13-16°	6.70-7.10	3990-5100	*High yield 3 casing volume purge
L27	A	CAFO and TSCA	Lateral		613.70	2.4-3.0	4.55-5.30	24 hours	9-13°	7.10-7.70	1000-1500	*Low yield well 1 casing volume purge
L28	A	CAFO and TSCA	Lateral		613.40	6.0-7.5	4.66-7.59	< 16 hours	10-15°	6.50-6.70	6000-6500	*High yield well 3 casing. Volume purge.
L29	A	CAFO only	Lateral		609.65	4.6-5.4	5.79-7.59	< 16 hours	9-15°	7.00-7.40	1000-1500	*High yield well 3 casing. Volume purge.

Table 5 (cont.)

SITE: Vickery (490)

WELL ID CHART

DATE: 11/14/86

[illegible]

WELL ID CHART

DATE: 11/14/86

[illegible]

Table 5 (cont.)

SITE: Vickery (490)

WELL ID CHART

DATE: 11/14/86

						NORMAL RANGE						
WELL ID #	ACTIVE OR CLOSED	PURPOSE	GRADIENT	DEPTH OF WELL (feet)	ELEVATION AT TOP OF CASING (msl)	PURGE VOLUME (gallons)	DEPTH TO WATER (feet)	RECHARGE TIME (hrs)	TEMP. (°C)	pH (Std)	SPECIFIC CONDUCT. (umhos) at 25°C	COMMENTS
T14	A	CAFO and TSCA	Lateral		609.84	3.1-3.3	7.0-9.9	3 days	11-12°	7.29-7.37	1900-2100	Low yield well 1 casing volume
T19	A	CAFO and TSCA	Lateral		618.04	12-13	9.9-11.1	8 hours	11-13°	7.29-7.64	*10,400-1280	Well with high yield 3 casing volume
T23	C											Plugged and abandoned 10/9/86
T23A	A	CAFO and TSCA	Lateral		613.05	@ 1 gallon	24.9	3 days	11.9	7.13	1720	Low yield well-1 casing volume
T24	A	CAFO only	Lateral		615.25	3.2-4.0	6.6-6.7	2 days	9.9-12.0	7.19-7.24	2050-2100	Replaces Low yield well
T27	A	CAFO and TSCA	Lateral		614.86	4.0-5.0	8.0-8.7	3 days	11.7-13.1	7.10-7.80	1200-9800	Low yield well
T37	A	CAFO	Lateral		615.22	3.7-3.9	3.49-4.00	3 days	12.2-12.5	7.10-7.22	2500-2900	Low yield well
T38	A	PVC well CWM Research	Lateral		614.50	3.5-3.7	2.37-2.84	3 days	10.0-12.5	7.10-7.22	2500-2900	Low yield well

*10,400 was back in April, well is still being developed by...

Table 6

Parameter, Bottle Type, and Preservative List

<u>Sampling Order</u>	<u>Parameter</u>	<u>Bottle Type</u>	<u>Preservatives</u>
1.	Volatile organics	2 - 40 mL VOA vials	Cool 4°C
2.	Field measurements	200 mL plastic	None
3.	Purgeable organic carbon (POC)	1 - 40 mL VOA vials	Cool 4°C
4.	Purgeable organic halogens (POX)	1 - 40 mL VOA vials	Cool 4°C
5.	Extractable organics	4 - 1 L. amber glass	Cool 4°C
6.	Pesticides/herbicides	2 - 1 L. amber glass	Cool 4°C
7.	Dioxin	2 - 1 L. amber glass	Cool 4°C
8.	Total organic carbon (TOC)	1 - 120 mL glass	H ₂ SO ₄ 2 ml (to pH <2) Cool 4°C
9.	Total organic halogens (TOX)	1 L. amber glass	Cool 4°C no headspace
10.	Total phenols (4AAP)	1 L. amber glass	H ₂ SO ₄ 2 ml (to pH <2)
11.	Cyanide	1 L. plastic	NaOH 2 ml (to pH <2) Cool 4°C
12.	Sulfide	1 L. plastic	Cool 4°C (to pH <2)
13.	Nitrate	1 L. plastic	H ₂ SO ₄ 2 ml (to pH <2) Cool 4°C
14.	Anions	1 L. plastic	
15.	Total metals	1 L. plastic	HNO ₃ 2 ml (to pH <2)
16.	Dissolved metals	1 L. plastic	HNO ₃ 2 ml (to pH <2)
17.	Field measurements	200 mL plastic	None

* Preservative Concentrations:

HNO₃ - 1:1 dilution of 35 % solution
 H₂SO₄ - Concentrated (98 %)
 NaOH - 400 g/L (10 Normal)

APPENDIX A

SUMMARY OF REGULATORY HISTORY

(from Comprehensive Monitoring Evaluation²³)

SUMMARY OF REGULATORY HISTORY

Date	Action	Comments
12-19-79	Preliminary Assessment (PA)	No action recommended
12-26-79	Preliminary Assessment (PA)	No action recommended
8-10-80	Notice of Hazardous Waste Activity	Submitted
11-19-80	RCRA Part A Application	Submitted most recent revision dated 10-4-85
12-2-80	OHIO EPA RCRA Inspection	6 violations
12-8-80	Complaint and Findings of Violation	\$2500 civil penalty, remediate out-of-compliance status
1-16-81	Response to Complaint and Findings	Response to the 6 violations listed and the civil penalty assessed in the complaint and findings of violation dated 12-18-80
1-22-81	Answer to Complaint	Court document containing issues presented in the response to complaint and findings of violation dated 1-16-81
1-22-81	USEPA Region V RCRA Inspection	Request for Office of Emergency and Remedial Response (OERR) to sample and analyze "PUG" material for EP Tox. All violations listed in RCRA inspection dated 12-2-80 are remediated
1-29-81	Consent Agreement and Final Order	Issue regarding "PUG" material removed. \$2500 civil penalty contested and not yet resolved.
2-9-81	Informal Settlement Conference	Conference regarding consent agreement and final order dated 1-29-81. Discussions regarding \$2500 civil penalty justification
2-25-81	Court Order	Order for parties in the consent agreement and final order dated 1-29-81 to decide NLT 3-10-81 how the \$2500 civil penalty issue will be determined

Date	Action	Comments
3-9-81	Court Order	Orders final settlement on consent agreement and final order dated 1-29-81 to be extended NLT 3-24-81
4-2-81	Supplemental Consent Agreement and Final Order	EP/TOX will be done on "PUG" material. Civil penalty reduced to \$2000
9-2-81	Ohio EPA RCRA Inspection	No violations
10-15-81	Certification by Administrative Law Judge	Official disposition and disposal of complaint and findings of violation dated 12-18-80
10-27-82	Ohio EPA RCRA Inspection	1 violation
1-10-83	USEPA Region V Letter of Warning	Violation of sect 3004 RCRA
3-30-83	USEPA Region V RCRA Inspection	Recommends PCB investigation in selected areas. Non-compliance regarding subpart F requirements
6-30-83	Ohio EPA Director's Final Findings and Orders	Alleges numerous violations of Federal and state environmental laws and regulations. Orders compliance of violations
6-30-83	Facility Authorization	Authorization from OEPA Director for continuation of deep-well injection activities
5-22-84	Consent Decree between Ohio EPA and CWM	Identifies numerous violations and deficiencies of state environmental protection codes. Civil penalty: \$5 million. Compensatory damages: \$2.4 million. Ohio superfund contribution: \$2 million
7-26-84	N.O.P.E. Inc. Appeal of Permit to Install Approval. Findings of Fact and Final Order	Appeal by citizens group, regarding Ohio EPA directors approval of a surface water management plan. Director's order was reaffirmed

Date	Action	Comments
9-19-84	Ohio EPA Director's Final Findings and Order	4 violations resulting in two air releases of possible hazardous gases
9-25-84	Ohio EPA Director's Final Findings and Orders	Recinds 2 orders issued on 9-19-84. Assesses a civil penalty of \$40,000. Sets operating hours of the facility
9-11-84	Ohio EPA RCRA Inspection	Not in compliance with subpart F requirements. Being mitigated currently
12-27-84	Ohio EPA RCRA Inspection	4 violations found
4-5-85	USEPA Complaint. Findings of Violation and Compliance Order	9 violations alleged. Civil penalty: \$200,000 requested
4-5-85	Consent Agreement and Final Order (CAFO)	Addresses many RCRA violations Orders facility to come into compliance except as noted in CAFO. Civic penalty: \$2.5 million
5-10-85	RCRA Part B Application	Submitted. The Part B has undergone numerous revisions with the most recently approved version being dated 11-8-85
12-11-85	Ohio EPA RCRA Inspection	No violations
12-31-85	Ohio EPA RCRA Inspection	Old ground-water monitoring system is not in compliance but under modification. Documentation under Subpart F in compliance
3-4-86	Hazardous Waste Release	Surface water release from retention area through a partially open gate
3-12-86	Ohio EPA Enforcement Response	Situation evaluated. 5 violations found
8-12-86	USEPA Comprehensive Ground-Water Monitoring Evaluation	

APPENDIX B

Off-Site Laboratory Evaluation Report

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

DATE: October 20, 1987

SUBJECT: On-Site Evaluation of ETC Laboratory for Vickery,
Ohio Analytical Activities

FROM: *Maxine Long*
Maxine Long, Chemist
Quality Assurance Office

TO: Joseph Fredle
Eastern District Office

THROUGH: *James H. Adams, Jr.*
James H. Adams, Jr., Chief
Quality Assurance Office

The results of the on-site laboratory evaluation of the Environmental Testing and Certification, Inc. (ETC) Laboratory, Edison, New Jersey are attached. The laboratory performs organic and inorganic chemical analyses for the Chemical Waste Management, Vickery, Ohio site as part of their self-monitoring requirements.

ETC is a modern, well run laboratory with excellent analytical capabilities. The deficiencies in the laboratory were those observed at the time of the on-site evaluation. They should be corrected as quickly as possible.

INORGANIC CHEMISTRY

On July 7, 1987, Donald Booker, Chemist, Quality Assurance Office (QAO), Environmental Services Division, Region V, conducted an on-site evaluation of the Environmental Testing and Certification, Incorporated (ETC) laboratory, Edison, New Jersey. The inspection was conducted pursuant to the National Hazardous Waste Groundwater Task Force Facility Assessment Program Plan.

The purpose of the visit was to evaluate the laboratory's capabilities to analyze groundwater samples for inorganic parameters (antimony, arsenic, cadmium, chromium, iron, lead, mercury, nickel, selenium, zinc, chloride, cyanide, TOC and TOX):

The evaluator has observed many good aspects of the laboratory procedures. The ETC personnel are well qualified to perform trace analyses of environmental samples for chemical contaminants and they maintain the instruments in good operating condition.

The laboratory evaluation team wishes to thank the laboratory staff for their courtesy and cooperation during the on-site evaluation.

The following are observations that were made during the evaluation and the recommendations of the Quality Assurance Office to ETC to improve the data quality:

1. Observation - The laboratory does not reanalyze the highest mixed calibration standard before beginning the sample run as mandatory by EPA Method 200.7 (ICP Method).

Recommendation - Before beginning the sample run, the laboratory should reanalyze the highest mixed calibration standard as if it were a sample. Concentration values obtained should not deviate from the actual values by more than ± 5 percent (or the established control limits whichever is lower).

2. Observation - The mid-check standard is used to determine the instrument drift. The acceptance criteria of the mid-check standard is not consistent with EPA Method 200.7.

Recommendation - The mid-check standard concentration values obtained should not deviate from the expected values by more than $\pm 5\%$ percent (or the established control limits whichever is lower).

3. Observation - An external quality control sample is used for the initial verification of the calibration standards. The acceptance criteria of $\pm 5\%$ percent of the true values listed for the control sample is not observed as mandatory by EPA Method 200.7.

Recommendation - The external quality control sample concentration values obtained should not deviate from the true values by more than $\pm 5\%$ percent.

4. Observation - The laboratory put a lot of emphasis on the objective to provide a measure of the accuracy and precision of analytical methods, but failed to emphasize continuing assessment of the accuracy and precision of data generated over time.

Recommendation - The laboratory should maintain a continuing assessment of the accuracy and precision of data generated over time.

On July 8, 1987, Donald Booker, Chemist, Quality Assurance Office (QAO), Environmental Services Division, Region V, conducted an on-site evaluation of Chyun Associates, Princeton, New Jersey. The inspection was conducted pursuant to the National Hazardous Waste Groundwater Task Force Facility Assessment Program Plan.

The purpose of the visit was to evaluate the laboratory's capabilities to analyze groundwater samples for inorganic parameters (total phenolics and sulfates). Chyun Associates is a sub-contractor of ETC.

The evaluator has observed many good aspects of the laboratory procedures. The Chyun Associates personnel are well qualified to perform trace analyses of environmental samples for chemical contaminants and they maintain the instruments in good operating conditions.

The laboratory evaluator wishes to thank the laboratory staff for their courtesy and cooperation during the on-site evaluation.

The following are observations that were made during the evaluation and the recommendations of the Quality Assurance Office to Chyun Associates to improve the data quality:

1. Observation - The total phenolics working standard curve is not continually verified by a check standard.

Recommendation - A check standard should be periodically employed to ensure that correct procedures are being followed and that all equipment is operating properly.

2. Observation - The acceptance criteria of total phenolics for the spike blank is not appropriate ($\pm 30.816\%$ of the expected value).

Recommendation - The spiked blank should be within $\pm 10\%$ of the expected value.

3. Observation - The sulfate working standard curve is not continually verified by a check standard.

Recommendation - A check standard should be periodically employed to ensure that correct procedures are being followed and that all equipment is operating properly.

4. Observation - The acceptance criteria of sulfate for the spiked blank is not appropriate ($\pm 50.436\%$ of the expected value).

Recommendation - The spiked blank should be within $\pm 10\%$ of the expected value.

5. Observation - The laboratory unsuccessfully analyzed total phenolics and sulfate on the performance evaluation U.S. EPA Water Pollution Study Number WP017.

Recommendation - The laboratory should analyze the total phenolics and sulfate performance evaluation samples sent to them by the Quality Assurance Office. The results should be sent back to the Quality Assurance Office as soon as possible.

Update 08-11-87 - The laboratory has successfully analyzed the total phenolics and sulfate performance evaluation samples sent to them by the Quality Assurance Office.

6. Observation - The laboratory put a lot of emphasis on the objective to provide a measure of accuracy and precision of analytical methods, but failed to emphasize continuing assessment of the accuracy and precision of data generated over time.

Recommendation - The laboratory should maintain a continuing assessment of the accuracy and precision of data generated over time.

ORGANIC CHEMISTRY

During July, 1987, Babu Paruchuri, Chemist, Quality Assurance Office (QAO), conducted an on-site evaluation of ETC laboratory pursuant to the Harzardous Waste Ground Water Task Force Program.

ETC had analyzed the parameters listed in Attachment A during Phase I monitoring activities. The laboratory was analyzing the parameters listed in Attachment B (Phase II) at the time of the audit. Attachment C of this report has the list of parameters that was proposed to be analyzed as per the Consent Agreement between Chemical Waste Management, Incorporated, Vickery, Ohio, and U.S. EPA. The U.S. EPA audit conducted during July, 1987, was concentrated on the laboratory data quality for the parameters listed in Attachments A & B. The overall performance of the laboratory is acceptable. Listed below are the deficiencies observed at ETC at the time of the quality assurance/quality control audit. These deficiencies may have been subsequently corrected.

Deficiency - The laboratory did not extract pesticides and PCBs samples at the pH range specified in the EPA manual, SW-846, Second Edition (1984). The audit team was told that the laboratory staff did not determine the pH of the water samples since the Sample Field Parameter forms (CC2) have the pH data on them.

Recommendation - If the laboratory can not extract (i.e., sample extraction by liquid-liquid or continuous extraction technique and concentration of the extract to 5.0 ml) pesticides and PCBs sample within 48 hours of collection, the sample should be adjusted to a pH range of 6.0 - 8.0 with sodium hydroxide or sulfuric acid, if α -BHC, γ -BHC, endosulfan I and II, and endrin are of interest. All samples must be extracted within 7 days and completely analyzed within 30 days of sample collection.

Deficiency - The laboratory did not extract the semivolatile (acid, base and neutrals) samples within 14 days of sample collection.

Recommendation - The sample semivolatile extraction step must be completed (i.e., sample extraction and concentration of the extract) within 14 days of sample collection. (Note: The EPA new RCRA methods manual, SW-846, Third Edition 1986, requires the semivolatile organic samples be extracted within 7 days of sample collection.)

GENERAL COMMENT

Since the second edition of SW-846 did not properly address the sample preservation and holding time requirement for aromatics in EPA methods 5030 and 8240, it is advised that the laboratory follow the sample preservation and holding time requirements specified in the method 8020.

VICKERY

ATTACHMENT A

Compound

Benzene
bis(chloromethyl) Ether
Bromoform
Carbon tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroform
Dichlorobromomethane
1,2-Dichloroethane
1,2-Dichloropropane
Ethyl benzene
Methyl chloride
Methyl ethyl ketone
Methylene chloride
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
o&p-Xylenes
Trichloroethylene

Aniline
o-Cresol
m & p-Cresols
o-Dichlorobenzene
m-Dichlorobenzene
2,4-Dimethyl phenol
Heptachlor
Methoxychlor
Naphthalene
2-Picoline
Methanol
PP/PCBs

ATTACHMENT B

(Organic Compounds Analyzed at ETC under Phase II)

Benzene
Chlorobenzene
Chloroform
1,2-Dichloroethane
Ethyl benzene
Methyl ethyl ketone
Toluene
1,1,1-Trichloroethane
Trichloroethylene
Methanol
PCBs

ATTACHMENT C

Proposed Analytical Scheme for Appendix VII (Compounds)

Isobutanol
Chloroacetaldehyde
Dichloropropanol
Methanol

Pyridine
Tetrachloroethylene
Methylene chloride
Trichloroethylene
1,1,1-Trichloroethane
Carbon tetrachloride
1,1,2-trichloro-1,2,2-trifluoroethane
Trichlorofluoromethane
Chlorobenzene
Toluene
Methyl ethyl ketone
Carbon disulfide
Chloroform
Methyl chloride
Acrylonitrile
1,2-Dichloroethane
1,1,2-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Vinyl chloride
1,1-Dichloroethylene
Benzene
1,1,2-Trichloropropane
1,2,3-Trichloropropane
1,2,2-Trichloropropane
bis(chloromethyl) ether

o-dichlorobenzene
o-cresol
m & p-cresol

Nitrobenzene
Pentachlorophenol
Phenol
2-Chlorophenol
p-chloro-m-cresol
2,4-Dimethyl phenol
2,4,5-Trichlorophenol
bis(2-chloroethyl) ether
2,4,6-Trichlorophenol
4-nitrophenol
4,6-Dinitro-o-cresol
2,3,5,6-Tetrachlorophenol

2,3,4,6-Tetrachlorophenol
2,3,4,5-Tetrachlorophenol
Chrysene
Naphthalene
Fluoranthene
Benzo(b)fluoranthene
Benzo(a)pyrene
Indeno(1,2,3-cd)pyrene
Benzo(a)anthracene
Dibenz(a)anthracene
Acenaphthalene
Benzyl chloride
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
m-Dinitrobenzene
2,4-Dinitrotoluene
2-Picoline
Hexachlorocyclopentadiene
2,4-Dichlorophenol
2,6-Dichlorophenol
Aniline
Diphenylamine
m-Dichlorobenzene
p-Dichlorobenzene
1,2,4-Trichlorobenzene
1,2,3-Trichlorobenzene
2,4,6-Trichlorobenzene
1,2,3,4-Tetrachlorobenzene
1,2,3,5-Tetrachlorobenzene
1,2,4,5-Tetrachlorobenzene
1,4-Naphthoquinone
Chlordane
Heptachlor
Toxaphene

Acrylamide
Acetonitrile
2,4-Toluene diamine
(o,m,p)-Phenylenediamines

Cadmium
Hexavalent chromium
Nickel
Lead
Arsenic
Mercury
Antimony
Chromium

Cyanide, Total

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

DATE: 1 March 1988

SUBJECT: Your Request for PE Results from ETC Corporation

FROM: Bob Gnaedinger, Chemist
QAS/5

Bob Gnaedinger
1 Mar 88

TO: Maxine Long, Microbiologist
QAS/5

ETC Corporation in Edison, NJ, normally participates in WS studies through the State of New Jersey, I am led to understand. I have received performance evaluation results only for WS019, WS020 and WS021. In response to your request this morning, I gave you a copy of their WS021 PE results. I am herewith attaching copies of their PE results from WS019 and WS020. Their Lab I.D. from EMSL is NJ136

encl

PERFORMANCE EVALUATION REPORT

DATE: 07/27/

WATER SUPPLY STUDY NUMBER WS020

LABORATORY NJ136

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
TRACE METALS IN MICROGRAMS PER LITER:					
ARSENIC	1	109	106	86.8- 121.	ACCEPTABLE
	2	34.0	32.0	25.8- 37.4	ACCEPTABLE
BARIUM	1	77.0	75.0	54.7- 88.6	ACCEPTABLE
	2	746	776	664.- 860.	ACCEPTABLE
CADMIUM	1	17.8	17.0	14.3- 19.6	ACCEPTABLE
	2	4.85	4.16	3.54- 4.79	NOT ACCEPTABLE
CHROMIUM	1	13.0	12.7	10.1- 15.6	ACCEPTABLE
	2	74.5	71.1	61.1- 80.9	ACCEPTABLE
LEAD	1	26.1	25.7	20.6- 30.5	ACCEPTABLE
	2	103	99.0	81.7- 113.	ACCEPTABLE
MERCURY	1	5.14	5.25	3.84- 6.54	ACCEPTABLE
	2	1.73	1.92	1.32- 2.47	ACCEPTABLE
SELENIUM	1	9.9	9.71	6.94- 12.2	ACCEPTABLE
	2	56.3	53.9	42.4- 65.7	ACCEPTABLE
SILVER	1	27.5	27.5	23.1- 31.9	ACCEPTABLE
	2	15.0	13.8	11.2- 16.6	ACCEPTABLE
NITRATE/FLUORIDE IN MILLIGRAMS PER LITER:					
NITRATE AS N	1	0.948	0.900	.762- 1.04	ACCEPTABLE
	2	6.95	7.00	6.18- 7.82	ACCEPTABLE
FLUORIDE	1	0.177	0.180	.148- .215	ACCEPTABLE
	2	1.54	1.60	1.48- 1.69	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY

PERFORMANCE EVALUATION REPORT

DATE: 07/27

WATER SUPPLY STUDY NUMBER WSO20

LABORATORY NJ136

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
INSECTICIDES IN MICROGRAMS PER LITER:					
ENDRIN	1	0.388	0.344	.211- .448	ACCEPTABLE
	2	6.77	6.19	3.86- 7.84	ACCEPTABLE
LINDANE	1	0.576	** 0.512	.279- .651	ACCEPTABLE
	2	4.23	** 3.84	2.22- 4.79	ACCEPTABLE
METHOXYCHLOR	1	2.37	2.22	1.34- 3.05	ACCEPTABLE
	2	84.2	80.8	52.4- 104.	ACCEPTABLE
TOXAPHENE	3	1.90	1.42	.432- 2.23	ACCEPTABLE
	4	8.93	7.09	3.85- 9.80	ACCEPTABLE
HERBICIDES IN MICROGRAMS PER LITER:					
2,4-D	1	64.9	** 62.7	26.0- 83.8	ACCEPTABLE
	2	3.36	3.22	.413- 5.66	ACCEPTABLE
2,4,5-TP (SILVEX)	1	31.0	** 30.0	9.42- 41.1	ACCEPTABLE
	2	3.63	** 3.71	1.23- 5.00	ACCEPTABLE
TRIHALOMETHANES IN MICROGRAMS PER LITER:					
CHLOROFORM	1	19.2	17.7	14.2- 21.2	ACCEPTABLE
	2	54.4	49.5	39.6- 59.4	ACCEPTABLE
BROMOFORM	1	53.2	42.2	33.8- 50.6	NOT ACCEPTABLE
	2	19.9	16.9	13.5- 20.3	ACCEPTABLE
BROMODICHLOROMETHANE	1	23.6	20.4	16.3- 24.5	ACCEPTABLE
	2	72.1	63.2	50.6- 75.8	ACCEPTABLE
DIBROMOCHLOROMETHANE	1	73.2	56.9	45.5- 68.3	NOT ACCEPTABLE
	2	31.2	24.9	19.9- 29.9	NOT ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
 ** SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.

PERFORMANCE EVALUATION REPORT

DATE: 07/27/

WATER SUPPLY STUDY NUMBER WS020

LABORATORY NJ136

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
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TRihalOMETHANES IN MICROGRAMS PER LITER:

TOTAL TRIHALOMETHANE	1	169.2	137.2	110.- 165.	NOT ACCEPTABLE
	2	177.6	154.5	124.- 185.	ACCEPTABLE

VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:

VINYL CHLORIDE	1	7.06	5.98	3.59- 8.37	ACCEPTABLE
1,1-DICHLOROETHYLENE	1	3.30	2.53	1.52- 3.54	ACCEPTABLE
	2	18.3	12.7	10.2- 15.2	NOT ACCEPTABLE
1,2-DICHLOROETHANE	1	6.99	6.23	3.74- 8.72	ACCEPTABLE
	2	11.1	8.90	5.34- 12.5	ACCEPTABLE
1,1,1-TRICHLOROETHANE	1	12.6	10.5	8.40- 12.6	ACCEPTABLE
	2	196	182.5	146.- 219.	ACCEPTABLE
CARBON TETRACHLORIDE	1	1.52	1.36	.816- 1.90	ACCEPTABLE
TRICHLOROETHYLENE	1	8.44	8.22	4.93- 11.5	ACCEPTABLE
	2	10.8	10.3	8.24- 12.4	ACCEPTABLE
BENZENE	1	3.76	4.32	2.59- 6.05	ACCEPTABLE
TETRACHLOROETHYLENE	2	7.60	8.16	4.90- 11.4	ACCEPTABLE
1,4-DICHLOROBENZENE	1	7.72	6.93	4.16- 9.70	ACCEPTABLE
CHLOROBENZENE	4	14.6	14.6	11.7- 17.5	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY

PERFORMANCE EVALUATION REPORT

DATE: 07/27/

WATER SUPPLY STUDY NUMBER WS020

LABORATORY NJ136

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:					
METHYLENE CHLORIDE	2	14.4	12.0	9.60- 14.4	ACCEPTABLE
1,1-DICHLOROETHANE	2	11.4	10.3	8.24- 12.4	ACCEPTABLE
1,1-DICHLOROPROPENE	2		31.6	25.3- 37.9	NOT ACCEPTABLE
1,1,2-TRICHLOROETHANE	2	14.2	12.8	10.2- 15.4	ACCEPTABLE
1,1,1,2TETRACHLOROETHANE2		15.4	17.3	13.8- 20.8	ACCEPTABLE
2-CHLOROTOLUENE	2	3.02	8.28	4.97- 11.6	NOT ACCEPTABLE
4-CHLOROTOLUENE	2	3.02		D.L.- D.L.	NOT ACCEPTABLE

MISCELLANEOUS ANALYTES:

TURBIDITY	1	4.28	4.50	3.84- 5.08	ACCEPTABLE
(NTU'S)	2	0.51	** 0.500	.341- .779	ACCEPTABLE
PH-UNITS	1	8.56	9.12	8.79- 9.34	NOT ACCEPTABLE
SODIUM	1	13650	14.5	13.4- 15.9	NOT ACCEPTABLE
(MILLIGRAMS PER LITER)					

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY
 ** SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.
 D.L. STANDS FOR DETECTION LIMIT

PERFORMANCE EVALUATION REPORT

DATE: 12/24/81

WATER SUPPLY STUDY NUMBER WS019

LABORATORY NJ136

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
ALL VALUES IN MICROGRAMS PER LITER (EXCEPT AS NOTED)					
CHLOROFORM	1	83.2	81.5	65.2- 97.8	ACCEPTABLE
	2	9.80	9.06	7.25- 10.9	ACCEPTABLE
BROMOFORM	1	22.4	20.2	16.2- 24.2	ACCEPTABLE
	2	87.7	84.3	67.4- 101.	ACCEPTABLE
BROMODICHLOROMETHANE	1	76.9	75.1	60.1- 90.1	ACCEPTABLE
	2	17.0	15.6	12.5- 18.7	ACCEPTABLE
DIBROMOCHLOROMETHANE	1	71.6	64.4	51.5- 77.3	ACCEPTABLE
	2	18.7	15.0	12.0- 18.0	NOT ACCEPTABLE
TOTAL TRIHALOMETHANE	1	254.0	241.2	193.- 289.	ACCEPTABLE
	2	133.2	124.0	99.2- 149.	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 01/07/8

WATER SUPPLY STUDY NUMBER WS021

LABORATORY NJ136

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
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TRACE METALS IN MICROGRAMS PER LITER:

CADMIUM	1	1.84	** 1.60	1.21- 2.25	ACCEPTABLE
	2	13.7	14.1	11.8- 16.6	ACCEPTABLE

TRihalOMETHANES IN MICROGRAMS PER LITER:

CHLOROFORM	1	12.2	14.1	11.3- 16.9	ACCEPTABLE
	2	58.6	74.2	59.4- 89.0	NOT ACCEPTABLE

BROMOFORM	1	65.3	63.3	50.6- 76.0	ACCEPTABLE
	2	28.4	27.4	21.9- 32.9	ACCEPTABLE

BROMODICHLOROMETHANE	1	11.0	11.1	8.88- 13.3	ACCEPTABLE
	2	39.1	40.9	32.7- 49.1	ACCEPTABLE

DIBROMOCHLOROMETHANE	1	43.5	44.4	35.5- 53.3	ACCEPTABLE
	2	17.8	17.8	14.2- 21.4	ACCEPTABLE

TOTAL TRIHALOMETHANE	1	132.0	132.9	106.- 159.	ACCEPTABLE
	2	143.9	160.3	128.- 192.	ACCEPTABLE

VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:

VINYL CHLORIDE	1	4.23	1.28	.768- 1.79	NOT ACCEPTABLE
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1,1-DICHLOROETHYLENE	1	6.92	7.27	4.36- 10.2	ACCEPTABLE
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1,2-DICHLOROETHANE	1	4.51	4.78	2.87- 6.69	ACCEPTABLE
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1,1,1-TRICHLOROETHANE	1	5.11	4.77	2.86- 6.68	ACCEPTABLE
	2		214.5	172.- 257.	NOT ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY
 ** SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.

PERFORMANCE EVALUATION REPORT

DATE: 01/07/88

WATER SUPPLY STUDY NUMBER WS021

LABORATORY NJ136

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
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VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:

ARBON TETRACHLORIDE	1	6.86	7.31	4.39- 10.2	ACCEPTABLE
RICHLOROETHYLENE	1	3.43	3.57	2.14- 5.00	ACCEPTABLE
ENZENE	1	2.26	2.37	1.42- 3.32	ACCEPTABLE
	2		11.9	9.52- 14.3	NOT ACCEPTABLE
,4-DICHLOROENZENE	1	4.84	4.68	2.81- 6.55	ACCEPTABLE
	2		12.6	10.1- 15.1	NOT ACCEPTABLE
OLUENE	2		8.10	4.86- 11.3	NOT ACCEPTABLE
ETHYLBENZENE	2		9.32	5.59- 13.0	NOT ACCEPTABLE
TOTAL XYLENES	2		6.86	4.12- 9.60	NOT ACCEPTABLE
STYRENE	2		11.4	9.12- 13.7	NOT ACCEPTABLE
PROPYLBENZENE	2		8.35	5.01- 11.7	NOT ACCEPTABLE
N-BUTYLBENZENE	2		10.5	8.40- 12.6	NOT ACCEPTABLE

MISCELLANEOUS ANALYTES:

PH-UNITS	1	9.1	**	9.14	8.81- 9.33	ACCEPTABLE
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* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
 * SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.

PERFORMANCE EVALUATION REPORT

DATE: 01/07/88

WATER SUPPLY STUDY NUMBER WS021

LABORATORY NJ136

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
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MISCELLANEOUS ANALYTES:

SODIUM (MILLIGRAMS PER LITER)	1	15.5	15.7	14.3- 17.5	ACCEPTABLE
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BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

APPENDIX C

Task Force Sampling Information

CHEMICAL WASTE MANAGEMENT, INC.
VICKERY, OHIO FACILITY

TASK FORCE SAMPLING INFORMATION

Well Number	Depth of Well (feet)	Depth To Water (feet)	Purge Vol. Calculated (gallons)	Purge Volume Actual (gal)	Purging		Sampling		Remarks
					Date 1987	Time(EST)	Date 1987	Time(EST)	
L15	17.50	3.25	7.10	2.40	4/6	1250-1302	4/7 4/8 4/8 4/9	1000-1012 1030-1033 1411-1415 {1010-1015 1615-1620	Field blank site. MQB 304
L19	19.43	9.50	4.80	2.33	4/6	1225-1235	4/6 4/7 4/7 4/8 4/8	1435-1450 1056-1106 1428-1431 1203-1212 1516-1530	
L20	15.60	4.66	5.50	2.00	4/6	1340-1345	4/6 4/7 4/7	1449-1453 1030-1040 1350-1356	Sample water turned dark during sampling for cyanide analysis, no odors detected.
L21	15.40	dry	--	0.20	4/7	1521-1523	4/8 4/8 4/9 4/9 4/10 4/13	1000-1011 1532-1536 1037-1043 1628-1632 1034-1039 1353-1356	
L26	19.91	15.79	7.30	3.00	4/6	1310-1320	4/7 4/7 4/7	0948-1007 1349-1405 1546-1552	Duplicate site.
L27	20.00	3.8	8.10	2.80	4/6	1204-1212	4/6 4/7 4/7 4/8 4/8	1433-1440 0937-0948 1444-1446 1058-1105 1546-1547	

CHEMICAL WASTE MANAGEMENT, INC.
VICKERY, OHIO FACILITY

TASK FORCE SAMPLING INFORMATION
(continued)

Well Number	Depth of Well (feet)	Depth To Water (feet)	Purge Vol. Calculated (gallons)	Purge Volume Actual (gal)	Purging		Sampling		Remarks
					Date 1987	Time(EST)	Date 1987	Time(EST)	
L29	19.43	5.92	6.80	2.90	4/7	1235-1245	4/7	1455-1514	
L31	17.45	5.40	5.90	2.75	4/6	1150-1205	4/6 4/7 4/8 4/8 4/9 4/10	1350-1530 1124-1132 0958-1007 1410-1423 1031-1035 1016-1027	
L34	22.50	10.63	5.84	2.00	4/7	1255-1309	4/8 4/8 4/9 4/10	1034-1058 1434-1442 1047-1102 0939-1004	Duplicate site.
L35	19.91	5.42	7.20	3.00	4/7	1327-1335	4/8 4/8 4/9 4/10	1125-1142 1457-1508 1014-1022 1046-1052	Field blank site. MBQ 311
L39	6.68	3.75	1.46	1.00	4/6	1137-1145	4/6 4/6 4/7	1359-1411 1513-1528 1119-1127	Background well.
T19	37.50	12.13	12.45	5.00	4/6	1245-1255	4/6 4/7 4/7 4/7	1510-1519 1023-1030 1417-1421 1615-1619	

CHEMICAL WASTE MANAGEMENT, INC.
VICKERY, OHIO FACILITY

TASK FORCE SAMPLING INFORMATION
(continued)

Well Number	Depth of Well (feet)	Depth To Water (feet)	Purge Vol. Calculated (gallons)	Purge Volume Actual (gal)	Purging		Sampling		Remarks
					Date 1987	Time(EST)	Date 1987	Time(EST)	
T24	24.96	20.66	2.15	0.60	4/6	1541-1547	4/7 4/7 4/8 4/8 4/9 4/9 4/10 4/13 4/14 4/15	1146-1200 1457 1128-1131 1600 1131-1133 1641-1645 1101-1105 1333-1339 1237-1245 0909-0920	Background well.
MW14R	62.45	13.50	24.4	25.0	4/8	1227-1310	4/8	1314-1328	
MW16R	67.50	19.00	24.0	25.0	4/8	1431-1507	4/8	1508-1518	
MW21R	69.67	18.93	25.4	25.0	4/8	1305-1335	4/8	1340-1358	
MW23RA	57.52	18.80	19.0	19.5	4/7	1215-1244	4/7	1247-1300	Initial purge water blackish with sulfide odor. Background well.
P10	87.20	12.81	36.6	37.0	4/14	0930-1150	4/7 4/14	1408-1600 1153-1227	Water had milky color after purging 5 gal. Water had sulfide odor.
Leachate Pond	--	--	--	--	--	--	4/14	1400-1430	
SE Leachate	--	--	--	--	--	--	4/14	1535-1600	
Meyers Ditch	--	--	--	--	--	--	4/13	1413-1424	

APPENDIX D

Task Force Sampling Parameters

SAMPLING PARAMETERS

Field Parameters

pH

Specific conductance

Temperature

Turbidity

Other Parameters

TOC	METHOD	9060
TOX	METHOD	9020
Chloride	METHOD	9252
Total phenols	METHOD	9066
Sulfate	METHOD	9036 or 9038
Nitrate	METHOD	9200
Ammonia	"Methods for Chemical Analysis of Water and Waste"	
	USEPA - E-51 (Cincinnati, 3/83, Method 350.1 or 350.3)	
POX	EPA 600/4-84-008	
POC	Ground Water, vol. 22, p. 18-23, 1984	
Dissolved metals	Total metals, and	
Cyanide	153-WA 84-T092	

Appendix VIII METALS

METHOD 6010

Aluminum
Barium
Beryllium
Boron
Cadmium
Chromium
Iron
Lead
Nickel
Thallium
Vanadium
Zinc


Selenium*
Arsenic*

*These elements are not approved for 6010 but they are approved for CLP metals ICP method. The CLP metals ICP method is identical to the SW-846/6010.

Method 7470

Mercury

Organics Analysis Data Sheet
(Page 1)

Laboratory Name: CompChem
Lab Sample ID No: CH089905A10
Sample matrix: liquid
Data Release
Authorized By: 

Case: 6016SAS1
GC Report No: _____
Contract No: 60-01-7263
Data Sample
Received: 06-11-86

Volatile Compounds
Concentration: 100
Date extracted/prepared: 06-17-86
Date analyzed: 06-17-86
Conc/Dil Factor: 1.00 pH: N/A
Percent moisture (not decanted): N/A

CAS Number	ug/l	CAS Number	ug/l
74-87-3 Chloroethane	10. U	10061-02-6 trans-1,3-Dichloropropene	5.0 U
74-85-9 Bromoethane	10. U	79-01-6 Trichloroethene	5.0 U
75-01-4 Vinyl Chloride	10. U	124-48-1 Dibromochloroethane	5.0 U
75-00-3 Chloroethane	10. U	79-00-5 1,1,2-Trichloroethane	5.0 U
75-09-2 Methylene Chloride	5.0 U	71-43-2 Benzene	5.0 U
67-64-1 Acetone	10. U	10061-01-5 cis-1,3-Dichloropropene	5.0 U
75-15-0 Carbon Disulfide	5.0 U	110-75-0 2-Chloroethyl Vinyl Ether	10. U
75-35-4 1,1-Dichloroethene	5.0 U	75-25-2 Bromoform	5.0 U
75-34-2 1,1-Dichloroethane	5.0 U	108-10-1 4-Methyl-2-pentanone	10. U
156-60-5 trans-1,2-Dichloroethene	5.0 U	591-78-6 2-Hexanone	10. U
67-66-3 Chloroform	5.0 U	127-18-4 Tetrachloroethene	5.0 U
107-06-2 1,2-Dichloroethane	5.0 U	79-34-5 1,1,2,2-Tetrachloroethane	5.0 U
78-93-3 2-Butanone	10. U	108-88-3 Toluene	5.0 U
71-55-6 1,1,1-Trichloroethane	5.0 U	106-90-7 Chlorobenzene	5.0 U
56-23-5 Carbon Tetrachloride	5.0 U	100-41-4 Ethyl Benzene	5.0 U
108-05-4 Vinyl Acetate	10. U	100-42-5 Styrene	5.0 U
75-27-4 Dibromodichloroethane	5.0 U	Total Xylenes	5.0 U
78-87-5 1,2-Dichloropropane	5.0 U		

DATA REPORTING QUALIFIERS

For reporting results to EPA, the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value If the result is a value greater than or equal to the detection limit then report the value.

(e.g. 10U). If limit of detection is 10ug and a concentration of 3ug is calculated, then report as 3.

U Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution actions. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.

C This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides >= 10ug/ul in the final extract should be confirmed by GC/MS.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.

J Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero

Other Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report.

Organics Analysis Data Sheet
 (Page 2)

Semivolatile Compounds

Concentration: 100
 Date extracted/prepared: 06-17-06
 Date analyzed: 06-19-06
 Conc/Bil Factor: 2.00
 Percent moisture (decanted): N/A

GPC Cleanup: No
 Separatory Funnel Extractions: Yes
 Continuous Liquid - Liquid Extractions: No

CAS			CAS		
Number		ug/l	Number		ug/l
108-95-2	Phenol	20. U	83-32-9	Acenaphthene	20. U
111-44-4	bis(2-Chloroethyl) ether	20. U	51-28-5	2,4-Dinitrophenol	100 U
95-57-8	2-Chlorophenol	20. U	100-02-7	4-Nitrophenol	100 U
341-73-1	1,3-Dichlorobenzene	20. U	132-64-9	Bibenzofuran	20. U
106-46-7	1,4-Dichlorobenzene	20. U	121-14-2	2,4-Dinitrotoluene	20. U
100-51-6	Benzyl Alcohol	20. U	606-20-2	2,6-Dinitrotoluene	20. U
95-50-1	1,2-Dichlorobenzene	20. U	84-66-2	Diethylphthalate	20. U
95-48-7	2-Methylphenol	20. U	7005-72-3	4-Chlorophenyl Phenyl ether	20. U
39638-32-9	bis(2-Chloroisopropyl) ether	20. U	86-73-7	Fluorene	20. U
106-44-5	4-Methylphenol	20. U	100-01-6	4-Nitroaniline	100 U
621-64-7	N-Nitroso-Dipropylamine	20. U	524-52-1	4,6-Dinitro-2-methylphenol	100 U
67-72-1	Hexachloroethane	20. U	86-30-6	N-nitrosodiphenylamine (1)	20. U
98-95-3	Nitrobenzene	20. U	101-55-3	4-Bromophenyl Phenyl ether	20. U
78-59-1	Isophorone	20. U	118-74-1	Hexachlorobenzene	20. U
88-75-5	2-Nitrophenol	20. U	87-86-5	Pentachlorophenol	100 U
105-67-9	2,4-Diethylphenol	20. U	85-01-8	Phenanthrene	20. U
45-85-0	Benzoic Acid	100 U	120-12-7	Anthracene	20. U
111-91-1	bis(2-Chloroethoxy) ethane	20. U	84-74-2	Di-n-butylphthalate	20. U
120-83-2	2,4-Dichlorophenol	20. U	206-44-0	Fluoranthene	20. U
120-82-1	1,2,4-Trichlorobenzene	20. U	129-00-0	Pyrene	20. U
91-20-3	Naphthalene	20. U	85-68-7	Butyl Benzyl Phthalate	20. U
106-47-8	4-Chloroaniline	20. U	91-94-1	3,3'-Dichlorobenzidine	40. U
87-68-3	Hexachlorobutadiene	20. U	56-55-3	Benzo(a)anthracene	20. U
59-50-7	4-Chloro-3-methylphenol	20. U	117-81-7	bis(2-ethylhexyl)phthalate	20. U
91-57-6	2-Methylnaphthalene	20. U	218-91-9	Chrysene	20. U
77-47-4	Hexachlorocyclopentadiene	20. U	117-84-0	Di-n-octyl Phthalate	20. U
88-06-2	2,4,6-Trichlorophenol	20. U	205-99-2	Benzo(b)fluoranthene	20. U
95-95-4	2,4,5-Trichlorophenol	100 U	207-08-9	Benzo(k)fluoranthene	20. U
91-58-7	2-Chloronaphthalene	20. U	50-32-8	Benzo(a)pyrene	20. U
88-74-4	2-Nitroaniline	100 U	193-39-5	Indeno(1,2,3-cd)pyrene	20. U
131-11-3	Diethyl Phthalate	20. U	53-70-3	Bibenz(a,h)anthracene	20. U
208-96-8	Acenaphthylene	20. U	191-24-2	Benzo(g,h,i)perylene	20. U
99-09-2	3-Nitroaniline	100 U			

(1) Cannot be separated from diphenylamine

 | Sample Number |
00398

Organics Analysis Data Sheet
 (Page 3)

Pesticide/PCBs

Concentration: [Low] Medium (Circle One)
 Date Extracted/Prepared: 06/14/86
 Data Analyzed: 06/22/86
 Conc/Dil Factor: 1.00

CAS Number		[ug/l] or ug/Kg (Circle One)
319-84-6	Alpha - BHC	.05 U
319-85-7	Beta - BHC	.05 U
319-86-2	Delta - BHC	.05 U
58-89-9.	Gamma - BHC(Lindane)	.05 U
76-44-8	Heptachlor	.05 U
309-00-2	Aldrin	.05 U
1024-57-3	Heptachlor Epoxide	.05 U
959-98-9	Endosulfan I	.05 U
60-57-1	Dieldrin	.10 U
72-55-9	4-4' - DDE	.10 U
72-20-8	Endrin	.10 U
33213-65-9	Endosulfan II	.10 U
72-54-8	4-4' - DDD	.10 U
1031-07-8	Endosulfan Sulfate	.10 U
50-29-3	4-4' - DDT	.10 U
72-43-5	Methoxychlor	.50 U
53494-70-5	Endrin Ketone	.10 U
57-74-9	Chlordane	.50 U
8001-35-2	Toxaphene	1.0 U
12674-11-2	Aroclor - 1016	.50 U
11104-28-2	Aroclor - 1221	.50 U
11141-16-5	Aroclor - 1232	.50 U
53469-21-9	Aroclor - 1242	.50 U
12672-29-6	Aroclor - 1248	.50 U
11097-69-1	Aroclor - 1254	1.0 U
11096-82-5	Aroclor - 1260	1.0 U

V(i) = Volume of extract injected (ul)
 V(s) = Volume of water extracted (ml)
 W(s) = Weight of sample extracted (g)
 V(t) = Volume of total extract (ul)

S) _ 1000.00_ or W(s) _____ V(t) _10000.00_ V(i) _ 5.0_

APPENDIX E
QA/QC SUMMARY
TASK FORCE SAMPLING

MEMORANDUM

DATE: September 14, 1987

SUBJECT: Evaluation of Quality Control Attendant to the Analysis of Samples
from the Chemical Waste Management, Vickery, Ohio Facility

FROM: Ken Partymiller, Chemist
PRC Environmental Management, Inc.

TO: HWGWTF: Richard Steimle, HWGWTF*
Paul H. Friedman, Chemist*
Gareth Pearson, EMSL/Las Vegas*
Joe Fredle, Region V
Maxine Long, Region V
Don Haggard, Region VIII

This memo summarizes the evaluation of the quality control data generated by the Hazardous Waste Ground-Water Task Force (HWGWTF) contract analytical laboratories (1). This evaluation and subsequent conclusions pertain to the data from the Chemical Waste Management, Vickery, Ohio sampling effort by the Hazardous Waste Ground-Water Task Force.

The objective of this evaluation is to give users of the analytical data a more precise understanding of the limitations of the data as well as their appropriate use. A second objective is to identify weaknesses in the data generation process for correction. This correction may act on future analyses at this or other sites.

The evaluation was carried out on information provided in the accompanying quality control reports (2-5) which contain raw data, statistically transformed data, and graphically transformed data.

The evaluation process consisted of three steps. Step one consisted of generation of a package which presented the results of quality control procedures, including the generation of data quality indicators, synopses of statistical indicators, and the results of technical qualifier inspections. A report on the results of the performance evaluation standards analyzed by the laboratory was also generated. Step two was an independent examination of the quality control package and the performance evaluation sample results by members of the Data Evaluation Committee. This was followed by a meeting (teleconference) of the Data Evaluation Committee to discuss the foregoing data and data presentations. These discussions were to come to a consensus, if possible, concerning the appropriate use of the data within the context of the HWGWTF objectives. The discussions were also to detect and discuss specific or general inadequacies of the data and to determine if these are correctable or inherent in the analytical process.

Preface

The data user should review the pertinent materials contained in the referenced reports (2-5). Questions generated in the interpretation of these data relative to sampling and analysis should be referred to Rich Steimle of the Hazardous Waste Ground-Water Task Force.

* HWGWTF Data Evaluation Committee Member

I. Site Overview

The Chemical Waste Management/Vickery facility is located in Vickery, Ohio. The facility is primarily an injection well facility. The facility also operated lagoons which are being closed. Solidified sludges from these lagoons will be placed in an on-site landfill. Until construction of this landfill is completed, these sludges are being stored in a large waste pile. Most of the samples collected for this study were collected from monitoring wells associated with the lagoons. Two leachate samples and a surface water sample were collected from the waste pile.

The facility has, in the past, accepted large quantities of waste oils. The facility operated an oil recycling facility which is now closed. The injection wells are used mainly for waste acids.

The geology at the facility consists of 75 to 100 feet of clay on top of sand. The injection wells are 2500 to 3000 feet deep and inject into a strata containing unusable salt water which is just above bedrock.

Twenty-six field samples were collected at this facility. The samples included two field blanks (MQB304 and 311), a trip blank (MQB301), and two sets of duplicate samples (MQB307/MQB319 and MQB314/MQB316). All samples were designated as low concentration ground-water samples except for samples MQB306 and 326 which were designated as medium concentration leachate samples, MQB310 which was designated as a medium concentration ground-water sample, and MQB313 which was designated as a low concentration surface water sample. All samples were analyzed for all HWGWTF Phase 3 analytes with the following exception. Sample MQB325 was not analyzed for chloroherbicides.

II. Evaluation of Quality Control Data and Analytical Data

1.0 Metals

1.1 Metals QC Evaluation

Total and dissolved spike recoveries were calculated for twenty-four metals which were spiked into two of three low concentration samples (MQB312, 319, and 321) and into one of two medium concentration samples (MQB306 and 326).

Twenty-two of the low concentration total metal average spike recoveries from these samples were within the data quality objectives (DQOs) for this Program. The average matrix spike recoveries for total cadmium (137 percent) and selenium (51 percent) were outside the DQO. Eight low concentration individual total metal spike recoveries were outside DQO and will be discussed in the following Sections. The total metal spike recoveries for aluminum and iron from sample MQB319 were not calculated because the amounts of these metals in this sample were greater than four times the amount of the spike. This information is listed in Tables 3-1a and 3-2a of Reference 2 as well as in the following Sections.

Twenty-two of the low concentration dissolved metal average spike recoveries were within the DQOs for this Program. The average matrix spike recoveries for dissolved iron (128 percent) and magnesium (73 percent) were outside DQO. Four individual dissolved metal spike recoveries were outside DQO and will be discussed in the following Sections. This information is listed in Tables 3-1c and 3-2c of Reference 2 as well as in the following Sections.

Seventeen of the medium concentration total metal spike recoveries from the spiked sample were within the DQOs for this Program. The matrix spike recoveries for total cadmium (62 percent), selenium (20 percent), silver (72 percent), thallium (74 percent), and tin (64 percent) were below the DQO. The total metal spike recoveries for arsenic and magnesium were not calculated because the amounts of these metals in the spiked sample were greater than four times the amount of the spike. This information is listed in Tables 3-1b and 3-2b of Reference 2 as well as in the following Sections.

Thirteen of the medium concentration dissolved metal spike recoveries were within the DQOs for this Program. The matrix spike recoveries for dissolved antimony (37 percent), cadmium (68 percent), copper (53 percent), lead (no recovery), mercury (60 percent), silver (62 percent), thallium (no recovery), and tin (34 percent) were outside DQO. The dissolved metal spike recoveries for calcium, potassium, and sodium were not calculated because the amounts of these metals in the spiked sample were greater than four times the amount of the spike. This information is listed in Tables 3-1d and 3-2d of Reference 2 as well as in the following Sections.

The calculable average relative percent differences (RPDs) for all metallic analytes, with the exceptions of total aluminum in the low concentration samples and total selenium in the medium concentration samples, were within Program DQOs. RPDs were not calculated for approximately two-thirds of the low concentration and one-half of the medium concentration metal analytes because the concentrations of many of the metals in the field samples used for the RPD determination were less than the contract required detection limit (CRDL) and thus were not required, or in some cases, not possible to be calculated.

Required metal analyte determinations were performed on all samples submitted to the laboratory.

No contamination involving the metallic analytes was reported in the laboratory blanks. Sampling blank contamination was reported and will be discussed in the following Sections.

1.2 Furnace Metals

The quality control results for the metals analyzed by graphite furnace atomic absorption analyses (antimony, arsenic, cadmium, lead, selenium, and thallium) were generally acceptable.

The matrix spike recoveries for total arsenic (72 percent) and selenium (50 percent) for the low concentration matrix spiked sample MQB312 were below their DQOs. The matrix spike recoveries for total arsenic (127 percent), cadmium (178 percent), lead (152 percent), and selenium (51 percent) for the low concentration matrix spiked sample MQB319 were outside their DQOs. The matrix spike recoveries for total cadmium (62 percent), selenium (20 percent), and thallium (74 percent) for the medium concentration matrix spiked sample MQB326 were below their DQOs. The matrix spike recoveries for dissolved antimony (37 percent), cadmium (68 percent), lead (no recovery), and thallium (no recovery) for the medium concentration matrix spiked sample (MQB306) were below their DQOs. No obvious trends were observed in these matrix spike results. All low concentration matrix results for total arsenic, cadmium, lead, and selenium should be considered semi-quantitative. Medium concentration matrix results for total and dissolved cadmium and total thallium should also be considered semi-quantitative. Dissolved antimony results for the medium concentration samples should be considered qualitative. Due

to the low spike recoveries, all medium concentration matrix results for total selenium and dissolved lead and thallium should not be used. All of these usability judgments may be further qualified.

Several continuing calibration verifications (CCVs) for total and dissolved arsenic and dissolved cadmium were outside DQO limits. The data for the CCV, which should have been run after recalibration, was missing. Total arsenic results for samples MQB314 and 316, dissolved arsenic results for samples MQB301, 306, 310, 313, and 318, and dissolved cadmium results for samples MQB309, 314, 316, 317, and 320 were affected and should be considered semi-quantitative unless otherwise qualified.

The correlation coefficients for the method of standard addition (MSA) determination of total antimony in sample MQB326D (D = duplicate analysis), dissolved antimony in sample MQB306D, total arsenic in sample MQB306, total cadmium in the laboratory control sample #3, dissolved cadmium in sample MQB306, and total lead in samples MQB305 and 320 were below DQO. The results for these analytes in the indicated matrices and samples, except for total arsenic in sample MQB306 and dissolved antimony in sample MQB306D, should be considered qualitative. The results for total arsenic in sample MQB306 and dissolved antimony in sample MQB306D should not be used.

The analytical spike recoveries of dissolved antimony in sample MQB306 and dissolved selenium in samples MQB306D and 326 ranged from 0 to 37 percent. These results should not be used.

The double burn precision for total selenium in sample MQB318 and for dissolved selenium in samples MQB306D and 310 was above DQO. Results for these analytes in these samples should be considered unusable.

The duplicate RPD for total selenium in sample MQB326 was above DQO. Total selenium result for this sample, unless otherwise qualified, should be considered semi-quantitative.

Dissolved lead contamination was found in field blanks MQB304 (16 ug/L) and MQB311 (6.8 ug/L). The lead CRDL is 5 ug/L. As a result of this contamination dissolved lead results for samples MQB305, 312, 319, 320, 322, 323, 324, and 325 (all positive lead results) should not be used. Other lead results (negative results) were not affected.

The usability of all graphite furnace analytes is summarized in Sections 5.0 and 5.1 at the end of this Report.

1.3 ICP Metals

The matrix spike recovery for dissolved tin (67 percent) in low concentration matrix sample MQB312 was below the DQO. The matrix spike recoveries for dissolved chromium (147 percent), iron (159 percent), and tin (57 percent) in low concentration matrix sample MQB319 were outside of their DQOs. The matrix spike recoveries for total silver (72 percent) and tin (64 percent) in medium concentration matrix sample MQB326 were outside of their DQOs. The matrix spike recoveries for dissolved copper (53 percent), silver (62 percent), and tin (34 percent) in medium concentration matrix sample MQB306 were below their DQOs. The trend of low spike recoveries indicate a low bias in the data and high spike recoveries indicate a high bias in the data. Results for these analytes in the above specified matrices should be considered semi-quantitative unless further qualified except for all

dissolved tin results in the medium concentration matrix which should be considered qualitative.

The low level (twice CRDL) linear range checks for all total beryllium, silver, vanadium, and zinc samples as well as for total cobalt and copper samples MQB301, 302, 306, 310, 313, 318, 321, 325, and 326 exhibited low recoveries. The low level linear range check for total manganese in samples MQB303, 304, 305, 307, 308, 309, 311, 312, 314, 315, 316, 317, 319, 320, 322, 323, and 324 exhibited high recoveries. The low level linear range checks for all dissolved beryllium, cobalt, chromium, silver, vanadium, and zinc samples, as well as for dissolved copper samples MQB301, 302, 306, 310, 313, 318, 321, 325, and 326, exhibited low recoveries. The low level linear range checks for dissolved manganese samples MQB301, 302, 306, 310, 313, 318, 321, 325, and 326 exhibited high recoveries. The data user should refer to Comment B5 of Reference 3 for a detailed listing of analysis dates, samples affected, and biases. The low level linear range check is an analysis of a solution with elemental concentrations near the detection limit. The range check analysis shows the accuracy which can be expected by the method for results near the detection limits. The accuracy reported for these metals at low concentrations is not unexpected. The recoveries indicate the possible directions and extent of the biases in the low concentration samples.

Dissolved aluminum contamination was reported in field blank MQB311 at a concentration of 259 ug/L. The aluminum CRDL is 200 ug/L. As a result of this contamination, all positive dissolved aluminum results (all are in the concentration range of the blank) should not be used. Total sodium contamination was reported in trip blank MQB301 at a concentration of 160,000 ug/L. The sodium CRDL is 5000 ug/L. As a result of this contamination, all positive total sodium results, with the exception of samples MQB301, 304, 306, 309, 310, 311, 317, and 323, should not be used. Total sodium results for samples MQB301, 304, 306, 310, and 311 should be considered quantitative while results for samples MQB309, 317, and 323 should be considered qualitative unless otherwise qualified. Dissolved sodium contamination was reported in trip blank MQB301 and field blank MQB304 at concentrations of 162,000 and 173,000 ug/L, respectively. As a result of this contamination, all positive dissolved sodium results, with the exception of samples MQB301, 304, 305, 306, 309, 310, 311, 317, and 323, should not be used. Total sodium results for samples MQB301, 304, 306, 310, and 311 should be considered quantitative while results for samples MQB305, 309, 317, and 323 should be considered qualitative unless otherwise qualified.

The serial dilution RPD results for total aluminum and dissolved calcium, manganese, and sodium in low concentration matrix sample MQB319 were outside DQO. The serial dilution RPD results for total potassium and dissolved calcium, potassium, and sodium in medium concentration matrix sample MQB306 were also outside DQO. All results for these analytes should be considered semi-quantitative unless otherwise qualified.

A continuing calibration verification (CCB) was missing from the raw data. CCBs should be run at a frequency of every 10 samples and also at the end of the analytical batch.

Although high sulfate concentrations were found in many of the samples, the barium matrix spike recoveries were all acceptable and thus possible sulfate interference with the barium determination was not expected to be significant.

The laboratory duplicate RPD for total aluminum in sample MQB319 was above DQO. The total aluminum result for this sample should be considered semi-quantitative unless otherwise qualified.

Duplicate field sample precision for total aluminum and dissolved nickel and sodium in duplicate sample pair MQB314/316 was poor. The comparative precision of field duplicate results is not used in the preparation of the usability evaluation of sample results. It is not possible to determine the source of this imprecision. The poor precision may be reflective of sample to sample variation rather than actual analytical variations.

The usability of all total and dissolved ICP metal analytes is summarized in Sections 5.2 and 5.3 at the end of this Report.

1.4 Mercury

The matrix spike recovery for dissolved mercury (60 percent) from medium concentration matrix sample MQB326 was below DQO. All medium concentration matrix results for dissolved mercury (MQB306, 310, and 326) should be considered semi-quantitative. All other mercury results should be considered quantitative.

2.0 Inorganic and Indicator Analytes

2.1 Inorganic and Indicator Analyte QC Evaluation

The average spike recoveries of all of the inorganic and indicator analytes, with the exceptions of those of sulfate and cyanide from the medium concentration samples, were within the accuracy DQOs. The matrix spike recoveries of sulfate (70 percent) and cyanide (13 percent) from the medium concentration matrix spikes were below DQO. Accuracy DQOs have not been established for the bromide, fluoride, nitrite nitrogen, and sulfide matrix spikes.

The calculable average RPDs for all inorganic and indicator analytes were within Program DQOs. RPDs were not calculated if either one or both of the duplicate values were less than the CRDL. Precision DQOs have not been established for bromide, fluoride, nitrite nitrogen, and sulfide.

Requested analyses were performed on all samples for the inorganic and indicator analytes.

No laboratory blank contamination was reported for any inorganic or indicator analyte. Sulfate, sulfide, POC and TOX contamination were each found in one of the field blanks (sample MQB304 or 311). This contamination will be discussed below.

2.2 Inorganic and Indicator Analyte Data

All results for bromide, fluoride, total phenols, TOC, and POX should be considered quantitative with an acceptable probability of false negatives.

The matrix spike recovery of cyanide (13 percent) from medium concentration matrix sample MQB306 was below DQO. The trend of low spike recoveries indicate a low bias in the data. Medium concentration cyanide results should not be used due to the poor matrix spike recovery. Low concentration matrix cyanide results should be considered quantitative.

The matrix spike recovery of chloride (120 percent) from low concentration matrix sample MQB319 was above DQO. The trend of high spike recoveries indicate a high bias in the data. The concentration of chloride reported by the analytical laboratory for sample MQB301 was incorrect. According to the raw data no chloride was detected in this sample. All low concentration matrix results for chloride should be considered semi-quantitative. All medium concentration matrix results should be considered quantitative.

The holding times for the nitrate and nitrite nitrogen determinations ranged from 9 to 38 days from receipt of the samples which is longer than the recommended 48 hour holding time for unpreserved samples. All nitrate and nitrite nitrogen results should be considered semi-quantitative.

The matrix spike recoveries of sulfate from low concentration matrix sample MQB312 (140 percent) and from the medium concentration matrix sample MQB306 (70 percent) were outside DQO. All sulfate results should be considered semi-quantitative unless otherwise qualified. Sulfate contamination was present in field blank MQB304 at a concentration of 1,880,000 ug/L. The sulfate CRDL is 1000 ug/L. As a result of this contamination, all positive sulfate results, except those for samples MQB301, 304, and 311, should not be used. Sulfate results for samples MQB301, 304, and 311 should be considered semi-quantitative.

Sulfide contamination was present in field blank MQB311 at a concentration of 217,000 ug/L. The sulfide CRDL is 1000 ug/L. As a result of this contamination, all positive sulfide results, except those for samples MQB301, 304, 305, 306, 311, 312, 315, 318, and 323, should not be used. Sulfide results for samples MQB301, 304, 305, 311, 312, 315, 318, and 323 should be considered quantitative and results for sample MQB306 should be considered qualitative.

Calibration verification standards for POC were not analyzed. A POC spike solution was run during the analytical batch but the "true" value of the spike was not provided by the laboratory. EPA needs to supply the inorganic laboratory with a POC calibration verification solution. Until then, the instrument calibration can not be assessed. POC contamination was present in field blank MQB311 at a concentration of 220 ug/L. The POC CRDL is 100 ug/L. As a result of this contamination, all positive POC results, except those for samples MQB301, 304, 306, 309, 310, and 311, should not be used. POC results for samples MQB301, 304, 306, 309, 310, and 311 should be considered qualitative. The POC holding time ranged from 4 to 13 days. Although the EMSL/Las Vegas data reviewers recommend a 7 day holding time, the EPA Sample Management Office (SMO) has instructed the lab that a 14 day holding time is acceptable.

TOX contamination was present in field blank MQB304 at a concentration of 9.4 ug/L. The TOX CRDL is 5 ug/L. As a result of this contamination, TOX results, with exceptions, should be considered quantitative unless otherwise qualified. TOX results for sample MQB318 should be considered qualitative and results for samples MQB305, 307, 312, 313, 315, 319, 320, 322, and 324 should not be used. Due to high chloride concentrations, constructive interference with the TOX determination was possible for samples MQB303, 317, 318, and 323. TOX results for these samples should be considered semi-quantitative, unless otherwise qualified, and biased high. In summary, TOX results, with exceptions, should be considered quantitative. TOX results for samples MQB303, 317, and 323 should be considered semi-quantitative. The TOX result for sample MQB318 should be considered qualitative. The TOX result for sample MQB305, 307, 312, 313, 315, 319, 320, 322, and 324 should not be used.

3.0 Organics and Pesticides

3.1 Organic QC Evaluation

All matrix spike average recoveries, with the exceptions of 2-chlorophenol and Parathion, were within established Program DQOs for accuracy. Matrix spike average recoveries for 2-chlorophenol (26 percent) and Parathion (123 percent) were outside DQO. Individual matrix spike recoveries which were outside DQO limits will be discussed in the appropriate Sections below.

All average surrogate spike recoveries, with the exceptions of 2-fluorobiphenyl in the sampling blanks and 2-fluorophenol in the matrix spike/matrix spike duplicate samples were within DQOs for accuracy. Individual surrogate spike recoveries which were outside the accuracy DQO will be discussed in the appropriate Sections below.

All reported matrix spike/matrix spike duplicate average RPDs were within Program DQOs for precision. Individual matrix spike RPDs which were outside the precision DQO will be discussed in the appropriate Sections below.

All average surrogate spike RPDs were within DQOs for precision. Surrogate standard were neither required nor used for the organo-phosphorous herbicide analysis.

Requested organic analyses were performed, with one exception, on all samples submitted to the laboratory. Sample MQB325 was not analyzed for chloroherbicides.

Laboratory (method) and sampling blank contamination was reported for organics and is discussed in Reference 4 as well as the appropriate Sections below.

Detection limits for the organic fractions are summarized in the appropriate Sections below.

3.2 Volatiles

The analytical laboratory exceeded the volatile holding time of seven days for all samples except MQB309, 314, 315, 317, and 324 by 1 to 70 days. Volatile results for these samples should not be used because they exceeded the holding time. Volatile results for all other samples should be considered quantitative.

Acetone contamination was found in laboratory (method) blanks MB-1 through MB-4, MB-7, and MB-8 at concentrations ranging from 1 to 7 ug/L. Acetone contamination was also found in the trip blank at a concentration of 6 ug/L. The acetone CRDL is 10 ug/L. Laboratory contamination is the probable source of this result. All positive acetone results (samples MQB301, 303, 306, 313, 314, 316, 317, 320, 321, 324, and 326), with the exception of sample MQB306 which had a high concentration of acetone, were judged to be unusable due to this blank contamination.

Laboratory (method) blanks MB-1 through MB-4 and MB-8 contained methylene chloride contamination at concentrations ranging from 1 to 5 ug/L. The methylene chloride CRDL is 5 ug/L. Laboratory contamination is the probable source of this result. All positive methylene chloride results (samples MQB306, 308, 310, 313, 315, 317, 318, 320, 324, and 326) should not be used due to this blank contamination.

Laboratory (method) blank MB-7 contained 2 ug/L of 2-butanone. The 2-butanone CRDL is 10 ug/L. As a result of this contamination, all positive 2-butanone results (sample MQB313) should not be used.

The matrix spike/matrix spike duplicate RPDs for trichloroethene, chlorobenzene, and benzene in sample MQB309 were above DQO. This lack of precision was judged not to affect data quality.

In their standards, the analytical laboratory confused the cis- and trans-1,3-dichloropropene isomers and the 4-methyl-2-pentanone and 2-hexanone isomers. As no dichloropropene isomers were found in the samples, the data quality for those isomers was not affected. 2-Hexanone and 4-methyl-2-pentanone were each reported in two volatile samples and their identifications were reversed. The data user should be aware of this reversal.

Erratic percent differences between the average response factors for the initial calibration and the daily calibration check standards were observed for various Appendix IX compounds.

Estimated method detection limits were CRDL for all samples, except MQB306 which was 100 times the CRDL. Dilution of this sample was required due to the high concentrations of acetone, isobutyl alcohol, and several other volatiles. The volatile results, with exceptions listed below, should be considered unreliable due to excessive holding times. Volatile results for samples MQB309, 314, 315, 317, and 324 should be considered quantitative with the exceptions of any acetone or methylene chloride results. No positive acetone, methylene chloride, or 2-butanone results should be used due to laboratory (method) blank contamination. The probabilities of false negative and positive results are acceptable (with the exceptions of the positive acetone and methylene chloride results, if any) for samples MQB309, 314, 315, 317, and 324 which had acceptable holding times.

3.3 Semivolatiles

The semivolatile holding time between sample receipt and analysis was exceeded by 22 to 36 days for all samples.

The matrix spike (MS) and/or matrix spike duplicate (MSD) recoveries for pentachlorophenol in samples MQB306MS (111 percent), MQB314MS (4 percent), MQB314MSD (6 percent), MQB316MS (6 percent), and MQB316MSD (6 percent) were outside DQO. The matrix spike and matrix spike duplicate recoveries for phenol in samples MQB306MS (168 percent), MQB306MSD (105 percent), MQB314MS (6 percent), MQB314MSD (10 percent), MQB316MS (8 percent), and MQB316MSD (6 percent) were outside DQO. The matrix spike recovery for 4-chloro-3-methylphenol in sample MQB306MS (99 percent) was above DQO. The matrix spike and matrix spike duplicate recoveries for 2-chlorophenol in samples MQB314MS (3 percent), MQB314MSD (4 percent), MQB316MS (3 percent), and MQB316MSD (3 percent) were below DQO. The matrix spike and matrix spike duplicate recoveries for 4-nitrophenol in samples MQB314MS (3 percent), MQB314MSD (3 percent), MQB316MS (3 percent), and MQB316MSD (3 percent) were below DQO. The low recoveries in certain of the samples may be due to a systematic interference in those samples.

The surrogate spike recoveries of 2-fluorophenol from samples MQB303, 303RE (reanalysis), 314, 314MS, 314MSD, 316, 316MS, 316MSD, 317, 317RE, 323, and 323RE, were below DQO. The surrogate spike recoveries of phenol-d5 from samples MQB314, 314MS, 316MS, 316MSD, 317, 317RE, 323, and 323RE, were below DQO. The surrogate spike recovery of 2-fluorobiphenyl from samples MQB302, 304, 305,

308, 311, 312, 315, 319, 320, 322, 325, MB-1, and MB-5 were below DQO. The surrogate spike recoveries of 2,4,6-tribromophenol from samples MQB314, 314MS, 314MSD, 316, 316MS, 316MSD, 317, 317RE, 323, and 323RE, were below DQO. Although, all other surrogate recoveries were within DQO, the acid surrogate recoveries for samples MQB314, 316, 317, and 323 were generally low and thus the acid fraction results for these samples are expected to be biased low.

Semivolatile laboratory (method) blanks, MB-1 through MB-6 contained contamination including several unknown compounds at estimated concentrations ranging from 10 to 200 ug/L as well as bis(2-ethylhexyl)phthalate at concentrations of 5 ug/L in MB-3 (method blank MB-3 was analyzed as a medium concentration sample, thus the sample was diluted by a factor of 100 and the resulting concentration was reported as 500 ug/L) and 6 ug/L in MB-6 and unknown alkylamides at estimated concentrations of 10 and 20 ug/L. The trip blank and one field blank also contained bis(2-ethylhexyl)phthalate at concentrations of 5 and 3 ug/L. The CRDL for bis(2-ethylhexyl)phthalate is 10 ug/L. No positive bis(2-ethylhexyl)phthalate results should be used due to this contamination. Positive sample results for semivolatile unknowns whose standards are found at approximate scan numbers 320, 353, 492, 1427, 1437 (an unknown alkylamide), 1508, 1518 (an unknown alkylamide), 1542, 1552, 1620/1621, 1725, 1758, and 1772, as well as unspecified 2-methylcyclopentanol isomers, should also not be used due to laboratory blank contamination.

Standards for all Appendix IX semivolatile compounds have not been obtained by the analytical laboratory. All results for these compounds, which were analyzed by using extracted ion current profiles for major ion quantitation, should be considered qualitative. The laboratory must obtain standards for these compounds.

All semivolatile samples, with the exceptions of leachate samples MQB306 and 326 which were diluted by factors of 2000 and 100, had dilution factors of two. As a result, the estimated detection limits for the semivolatiles, with the exceptions of samples MQB306 and 326, were approximately twice the CRDL. The estimated detection limits for samples MQB306 and 326 are approximately 2000 and 100 times the CRDL.

The semivolatile data are acceptable and the results should be considered semi-quantitative with the exceptions of the results for the semivolatile compounds for which there were no analytical standard and the compounds which had blank contamination. The results for the Appendix IX compounds mentioned above should be considered qualitative. All positive bis(2-ethylhexyl)phthalate results, as well as all results for unknowns at the scan numbers listed above, should not be used due to blank contamination. Probabilities of false negatives and positives are acceptable with the exceptions of false negatives for the two diluted samples and the possibility of false negative and positive results for the compounds for which there were no analytical standards.

3.4 Pesticides

No laboratory (method) blank contamination was detected for the pesticides. Chromatographic contamination was present in both samples and blanks in the region of the BHCs and aldrin. A unidentified chromatographic peak was present at a retention time of approximately 3.65 minutes in all samples and blanks run on the OV-101 column.

The retention times for the pesticide standards for endrin, endrin aldehyde, endrin ketone, aldrin, heptachlor epoxide, DDT, methoxychlor, beta-BHC, and delta-BHC fell outside the laboratory's established retention time window.

The presence of an early eluting chromatographic peak may have obscured the detection of BHCs and Aroclors. False negative results for these pesticides are a possibility.

The estimated method detection limits for all pesticides analyses, with the exceptions of samples MQB306, 310, 314, 316, and 326, are the CRDLs. Samples MQB306 (diluted by a factor of 10), 310 (10), 314 (5), 316 (5), and 326 (2) were diluted prior to analysis and therefore have elevated detection limits. The pesticides results should be considered qualitative with the exceptions of results for endrin, endrin aldehyde, endrin ketone, aldrin, heptachlor epoxide, DDT, methoxychlor, BHCs, and the Aroclors. False negative results are possible for these pesticides as the retention times for their standards were outside of the analytical laboratory's established retention time window and because of the presence of an early eluting chromatographic peak. Results for these pesticides should not be used.

3.5 Herbicides

The herbicides for which the laboratory analyzed include only 2,4-D, 2,4,5-T, 2,4,5-TP, chlorobenzilate, phorate, disulfoton, parathion, and famphur. Sample MQB325 was not analyzed for chloroherbicides due to an insufficient volume of sample.

2,4-DB was used as a surrogate for the chloroherbicide fraction. No surrogates were included for the organo-phosphorous herbicides.

Numerous artifact peaks or interferences were observed in the chloroherbicide method blank and sample chromatograms. These peaks are at concentrations near the CRDL for most of the target analytes. Samples MQB303, 306, 314, 315, 316, 317, 318, and 326 contained peaks at concentrations above target analyte CRDLs. False negatives are a possibility for these samples.

Due to large background interferences, the chloroherbicide matrix spike compounds could not be quantitated in sample MQB306MS/MSD.

Unidentified peaks were also present in the organo-phosphorous herbicide chromatogram for sample MQB306. One of these peaks was just outside the phorate retention time window. Confirmation analysis was not performed. False negative results have an enhanced probability for this sample.

The chloroherbicide fraction for samples MQB306 and 326 were diluted by factors of 1000 and 100. The organo-phosphorous herbicide fraction for samples MQB306 and 326 were each diluted by a factor of 100. False negative results have an enhanced probability for these samples.

The estimated method detection limits were the CRDL for the organo-phosphorous herbicides with the exceptions of the diluted samples. The organo-phosphorous herbicide results should be considered qualitative due to the lack of a surrogate. Although surrogates are routinely used in organic analyses, results of the organo-phosphorous herbicides are less confident since no surrogates were used here. The results for chloroherbicides should not be used.

4.0 Dioxins and Furans

4.1 Dioxin and Furan QC Evaluation

The recoveries of the dioxin native spikes from two blank samples and a field sample (spiked and analyzed in duplicate) ranged from 88 to 112 percent which is within the DQO range.

Samples MQB302, 307, and 320 were analyzed in duplicate. No target analytes were detected in samples MQB302 and 320. Sample MQB307 was spiked prior to its duplicate analysis. No dioxins or furans were detected in the duplicate field samples and thus method precision could not be evaluated.

Dioxin and furan determinations were performed on all samples which were submitted to the laboratory. No dioxins or furans were detected in the field samples.

Dioxin and furan contamination was neither detected in the laboratory (method) blanks nor the field blanks.

4.2 Dioxin and Furan Data

Due to a method modification supplied to the laboratory by the EPA Sample Management Office, the column performance check solution was not analyzed by the laboratory.

The resolution (percent valley) between the internal standard (carbon-13 labeled 2,3,7,8-TCDD) and the recovery standard (carbon-13 labeled 1,2,3,4-TCDD) was above DQO for three initial calibration analyses, two continuing calibration analyses, three blanks, and samples MQB301, 302D (duplicate), 304, 306, 309, 310, 313, 314, 318, 322, 325, and 326.

Many of the ion current profiles exhibited poor peak shape. This may be the result of lack of sample carbon clean-up and results in poor signal to noise ratios and raised detection limits.

The dioxin and dibenzofuran results should be considered to be semi-quantitative. The probability of false negative results is acceptable. Dioxin and dibenzofuran detection limits should be considered to be about three times the normal method detection limits.

III. Data Usability Summary

5.0 Graphite Furnace Metals, Total (See Section 1.2)

Quantitative:	all low concentration antimony and thallium results; low concentration cadmium and lead results with exceptions; all medium concentration antimony and lead results; medium concentration arsenic results with exceptions
	Semi-quantitative: low concentration arsenic and selenium results with exceptions; all medium concentration cadmium and thallium results; cadmium results for samples MQB303 and 318; lead results for samples MQB302, 307, 314, 315, 316, 318, 319, 321, and 322
	Qualitative: medium concentration selenium results with exceptions; arsenic results for samples MQB309 and 319
	Unusable: arsenic results for samples MQB306 and 323; the

cadmium result for sample MQB325; the lead result for sample MQB303; selenium results for samples MQB310 and 318.

5.1 Graphite Furnace Metals, Dissolved (See Section 1.2)

Quantitative: all low concentration antimony, arsenic, selenium, and thallium results; low concentration cadmium and lead results with exceptions; all medium concentration results for arsenic; selenium results for sample MQB306

Semi-quantitative: medium concentration cadmium results with exceptions; cadmium results for samples MQB309, 314, 316, 317, and 320

Qualitative: medium concentration antimony results with exceptions; the cadmium result for sample MQB306

Unusable: all medium concentration lead and thallium results; medium concentration selenium results with exceptions; lead results for samples MQB305, 308, 312, 316, 319, 320, 322, 323, 324, and 325; the antimony result for sample MQB306; the selenium result for sample MQB310.

5.2 ICP Metals, Total (See Section 1.3)

Quantitative: all barium, beryllium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, vanadium, and zinc results; all low concentration potassium, silver, and tin results; all medium concentration aluminum results; medium concentration sodium results with an exception

Semi-quantitative: all low concentration aluminum results; all medium concentration potassium, silver, and tin results

Qualitative: sodium results for samples MQB309, 317, and 323

Unusable: low concentration sodium results with exceptions; the sodium result for sample MQB326

5.3 ICP Metals, Dissolved (See Section 1.3)

Quantitative: all barium, beryllium, chromium, cobalt, nickel, vanadium, and zinc results; all low concentration copper, potassium, and silver results; all medium concentration iron, magnesium, and manganese results; iron results for samples MQB302, 304, 307, 309, 319, 320, 322, and 324; aluminum results for samples MQB302, 304, and 320

Semi-quantitative: all low concentration calcium, magnesium, manganese, and tin results; low concentration iron results with exceptions; all medium concentration calcium, copper, potassium, and silver results; medium concentration sodium results with an exception

Qualitative: all medium concentration tin results; sodium results for samples MQB305, 309, 317, and 323

Unusable: all aluminum results; low concentration sodium results with exceptions; iron results for samples MQB303, 311, and 321; sodium results for sample MQB326

5.4 Mercury (See Section 1.4)

Quantitative: all total mercury results; dissolved mercury results with exceptions

Semi-quantitative: dissolved mercury results for samples MQB306, 310, and 326

5.5 Inorganic and Indicator Analytes (See Section 2.2)

Quantitative:	all bromide, fluoride, total phenols, TOC, and POX results; all low concentration matrix cyanide results; all medium concentration matrix chloride results; sulfide results for samples MQB301, 304, 305, 311, 312, 315, 318, and 323; TOX results with exceptions
Semi-quantitative:	all nitrate and nitrite nitrogen results; all low concentration chloride results; TOX results for samples MQB303, 317, and 323
Qualitative:	all POC results; the sulfide result for sample MQB306
Unusable:	all medium concentration cyanide results; sulfate and sulfide results with exceptions; TOX results for samples MQB305, 307, 312, 313, 315, 319, 320, 322, and 324

5.6 Organics (See Sections 3.2 through 3.5)

Quantitative:	volatile results for samples MQB309, 314, 315, 317, and 324 with the exception of positive acetone and methylene results which should not be used
Semi-quantitative:	semivolatile results with exceptions
Qualitative:	results for Appendix IX semivolatile compounds for which there were no analytical standards; pesticide results with exceptions; organo-phosphorous herbicide results
Unusable:	volatile results with exceptions; all positive acetone, methylene chloride, and 2-butanone (all are volatiles) results; all bis(2-ethylhexyl)phthalate (a semivolatile) results; all positive 2-methylcyclopentanol isomer results; all positive semivolatile results for alkylamides found at scan numbers 1437 and 1518; all positive semivolatile unknown compound results at scans 320, 353, 492, 1427, 1508, 1542, 1552, 1620/1621, 1725, 1758, and 1772; pesticide results for endrin, endrin aldehyde, endrin ketone, aldrin, heptachlor epoxide, DDT, methoxychlor, beta-BHC, delta-BHC, and the Aroclors; all chloro-herbicide results

5.7 Dioxins and Furans (See Section 4.2)

Semi-quantitative: all dioxin and furan results

IV. References

1. Organic Analyses: CE-EMSI
4765 Calle Quetzal
Camarillo, CA 93010

Inorganic and Indicator Analyses:
Centec Laboratories
P.O. Box 956
2160 Industrial Drive
Salem, VA 24153
(703) 387-3995

Dioxin and Furan Analyses:

CompuChem Laboratories, Inc.
P.O. Box 12652
3308 Chapel Hill/Nelson Highway
Research Triangle Park, NC 27709
(919) 549-8263

2. Draft Quality Control Data Evaluation Report (Assessment of the Usability of the Data Generated) for Case M-2363HQ, Site 57, Chemical Waste Management, Vickery, OH, Prepared by Lockheed Engineering and Management Services Company, Inc., for the US EPA Hazardous Waste Ground-Water Task Force, 8/5/1987.
3. Draft Inorganic Data Usability Audit Report, for Case M-2363HQ, Chemical Waste Management, Vickery, OH, Prepared by Laboratory Performance Monitoring Group, Lockheed Engineering and Management Services Co., Las Vegas, Nevada, for US EPA, EMSL/Las Vegas, 8/5/1987.
4. Draft Organic Data Usability Audit Report, for Case M-2363HQ, Chemical Waste Management, Vickery, OH, Prepared by Laboratory Performance Monitoring Group, Lockheed Engineering and Management Services Co., Las Vegas, Nevada, for US EPA, EMSL/Las Vegas, 8/5/1987.
5. Draft Dioxin/Furan Usability Audit Report, for Case M-2363HQ, Chemical Waste Management, Vickery, OH, Prepared by Laboratory Performance Monitoring Group, Lockheed Engineering and Management Services Co., Las Vegas, Nevada, for US EPA, EMSL/Las Vegas, 8/5/1987.

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APPENDIX F
ANALITICAL RESULTS
TASK FORCE SAMPLES

SUMMARY OF CONCENTRATIONS FOR COMPOUNDS FOUND
IN GROUND-WATER AND SAMPLING
BLANK SAMPLES AT CWM, VICKORY, OH

The following table lists the concentrations for compounds analyzed for and found in samples at the site. Table A2-1 is generated by listing all compounds detected and all tentatively identified compounds reported on the organic Form I, Part B. All tentatively identified compounds with a spectral purity greater than 850 are identified by name and purity in the table. Those with a purity of less than 850 are labeled, unknown.

TABLE KEY

A value without a flag indicates a result above the contract required detection limit (CRDL).

- J Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero. If the limit of detection is 10 μg and a concentration of 3 μg is calculated, then report as 3J.
- B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.

GW = ground-water

SW = surface-water

low and medium are indicators of concentration.

Results for the samples reanalyzed and/or reextracted are preceded by a / (slash).

All concentrations are in $\mu\text{g/L}$.

SITE: CHEM WASTE
CASE NO: 2243/N

SAMPLE NO:	SAMPLE LOCATION:	SAMPLE TYPE:	NORTHERN										LEACHATE
			NORTHERN TSP BLANK CV-LOW	NORTHERN FIELD BLANK CV-LOW	NORTHERN FIELD BLANK CV-LOW	NORTHERN WELL L-24 MP CV-LOW	NORTHERN WELL L-24 MP CV-LOW	NORTHERN WELL L-24 MP CV-LOW	NORTHERN WELL L-24 MP CV-LOW	NORTHERN WELL L-24 MP CV-LOW	NORTHERN WELL L-24 MP CV-LOW	NORTHERN WELL L-24 MP CV-LOW	NORTHERN WELL L-24 MP CV-LOW
10A	ACETONE		5 J			3 J	4 J/3 J				3 J		14000 J
	BENZENE												
	2-BUTANONE												
	CARBON DISULFIDE												
	CYCLOHEXANE												2600
	CYCLOHEXANE												
	1,1-DICHLOROMETHANE					1 J	1 J/2 J						
	1,2-DICHLOROMETHANE												
	2-METHANOL					3 J					3 J		
	METHYLENE CHLORIDE												540 J
	4-METHYL-2-PENTANONE												1600
	TOLUENE												520
	TRICHLOROMETHANE												
	TRICHLOROMETHANE												150 J
ADD	1,4-DIOXANE												4000 J
10A	ISOBUTYL ALCOHOL												27000
TIC	ACETIC ACID, ETHYL ESTER												
10A	BUTANE												
	CYCLOHEXANE												
	CYCLOPENTANE												
	CYCLOPENTANE, METHYL												
	METHANE, THIOBIS												
	3-PENTANONE												
	UNKNOWN ALIPHATIC ALCOHOL												IPUR 966 1000J
	UNKNOWN												
	UNKNOWN												
SEMI-	BENZOIC ACID						7 J						19000
10A	BIS(2-ETHYLHEXYL)PHthalate		5 J	3 J		3 J	8 J	3 J	5 J	4 J	3 J/17 J		
	2-CYCLOHEXYL												4200 J
	DI-N-BUTYLPHthalate					12	9 J		2 J				5300 J
	2,4-DIMETHYLPHENOL												25000
	4-METHYLPHENOL					3 J			2 J	3 J			33000
	PHENOL												
ADD	4-METHYL-2-PENTANONE					3 J							
SEMI	N-NITROSCOPHOLINE												
10A													
SEMI-	1,3-PROPANEDIOL, 2,2-DIMETHYL												
10A	2-CYCLOHEXYL-1-ONE						IPUR 935 10 J						
TIC	2-METHYLCYCLOPENTANOL ISOMERS												
	2-PROPANOL, 1-1000-2-METHYL					IPUR 914 10 J	IPUR 888 40 J		IPUR 890 30 J		IPUR 881 10 J		
	2-PROPANOL, N-												
	(1,1-DIMETHYL-ETHYL)										IPUR 930 20		
	2-PROPANOL, N-										IPUR 926 /20 J		
	(1,1-DIMETHYL-3-OXYBUTYL)										IPUR 919 /200 J		

[illegible]

8039
A 5-7-6 USU M-2

NR013
031330 ZNUN /NIAUO

[illegible]

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2
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PROBATION	100000	107000	102000	98000	70200	365000	100000	1400
MAINTENANCE	1	1	401	415	181	981	11	
REPAIRS	1	1	1	1	1	1	1	

	CENTS	MINUTES
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10
11	11	11
12	12	12
13	13	13
14	14	14
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66	66	66
67	67	67
68	68	68
69	69	69
70	70	70
71	71	71
72	72	72
73	73	73
74	74	74
75	75	75
76	76	76
77	77	77
78	78	78
79	79	79
80	80	80
81	81	81
82	82	82
83	83	83
84	84	84
85	85	85
86	86	86
87	87	87
88	88	88
89	89	89
90	90	90
91	91	91
92	92	92
93	93	93
94	94	94
95	95	95
96	96	96
97	97	97
98	98	98
99	99	99
100	100	100

[illegible][illegible]

SITE: CHEN WASTE
CASE NO: 2343/M

SAMPLE NO.	NOB101	NOB104	NOB111	NOB114	NOB11A/ NOB11ADA	NOB107	NOB110	NOB102	NOB103/ NOB103DE	NOB105	NOB106	LEACHATE
SAMPLE LOCATION	TRIP BLANK	FIELD BLANK	FIELD BLANK	WELL 1-24 DUP	WELL 1-24 DUP	WELL 1-24 DUP	WELL 1-24 DUP	WELL 1-25	WELL 1-15	WELL MW-218	WELL	
SAMPLE TYPE	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-MED	
COPPER				12	10			24	12		124	
IRON	77		24	55	55				31	304	1400	
LEAD		14	4.0		14		19			13		
MAGNESIUM	460		454	102000	105000	94000	104000	79200	365000	204000	1840	
MANGANESE				19400	14800	295	277	23	890	11		
MERCURY												
NICKEL				93	141	60	112	37	230		1240	
POTASSIUM	1170		1080	2530	2650	2530	2750	4120	4450	17200	2720000	
SELENIUM											34	
SILVER												
SODIUM	162000	173000	1120	734000	709000	31200	38500	35100	320000	1260000	4070000	
THALLIUM												
TIN												
UANIUM									14		14	
ZINC									45			
INDIC, BROMIDE											100000	
INDIC, CHLORIDE				1000000	875000	218000	200000	14000	2330000	448000	10000000	
CYANIDE											4330	
FLUORIDE											640000	
NITRATE NITROGEN											120000	
NITRITE NITROGEN												
PDC	32	40	220	29	20	38	59	48	84	440	16200	
POY											2700	
SULFATE		1880000		550000	550000	220000	185000	275000	810000	1870000	1180000	
SULFIDE			217000	704000	674000	734000	700000	642000	346000		1440000	
TDC				40000	49000	5100	4400	1600	23000	3200	8500000	
TOTAL PHENOLS				59							613000	
TOY		9.4		2000	1740	18	19		162	15	382000	

SITE: OPEN WASTE
CASE NO:2353/N

SAMPLE NO:		MOR109	MOR109/	MOR110	MOR112	MOR113	MOR115/	MOR117/	MOR119	MOR120/	MOR121	MOR122
SAMPLE LOCATION:		WELL MW-14P	WELL MW-23P	WELL P-10	WELL MW-14P	WELLS CREEK	WELL L-27	WELL L-20	WELL L-21	WELL L-29	WELL L-31	WELL L-39
SAMPLE TYPE:		GW-LOW	GW-LOW	GW-MED	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW
VOA	ACETONE						1 J		4 JR/6 JR		3 JR/6 JR	3 J
	BENZENE			12								
	2-METHANONE						5 J					
	CARBON DISULFIDE											
	CHLOROBENZENE											
	CHLOROFORM		/1 J									
	1,1-DICHLOROETHANE											
	1,2-DICHLOROETHANE											
	2-METHANONE											
	METHYLENE CHLORIDE	3 J		6 P		1 J	2 JR/11 JR	1 JR	2 J	/1 JR		
	4-METHYL-2-PENTANONE											
	TOLUENE			5								
	TRICHLOROETHANE											
	TRICHLOROETHENE											
ADD.	1,4-DIOXANE											
VOA	ISOBUTYL ALCOHOL											
TIC-VOA	ACETIC ACID, ETHYL ESTER											
	BUTANE			IPUR 900 20 J								
	CYCLOHEXANE			IPUR 927 3 J								
	CYCLOPENTANE			IPUR 941 5 J								
	CYCLOPENTANE, METHYL			IPUR 935 20 J								
	METHANE, THIOLIS											
	3-PENTANONE											
	UNKNOWN ALIPHATIC ALCOHOL											
	UNKNOWN			30 J								
	UNKNOWN			30 J								
SEMI-VOA	BENZOIC ACID											
	BIS(2-ETHYLHEXYL)PHTHALATE	3 J	5 J	4 J	2 J	4 J	3 J	3 J/66 JR	3 J	3 J	2 J	2 J
	2-CHLOROPHENOL											
	DI-N-BUTYLPHTHALATE											
	2,4-DIMETHYLPHENOL											
	4-METHYLPHENOL											
	PHENOL											
ADD	4-METHYL-2-PENTANONE											
SEMI-VOAS	N-NITROSMORPHOLINE							4 J/8 J				
SEMI-VOA TIC	1,3-PROPANEDIOL, 2,2-DIMETHYL							IPUR 946 / 2 J				
	2-CYCLOHEXYEN-1-ONE											
	2-METHYLCYCLOPENTANOL ISOMERS	IPUR 904 50 J					IPUR 891 8 J		IPUR 898 10 J			
	2-PROPANOL, 1-1000-2-METHYL											
	2-PROPENAMIDE, N-											
	(1,1-DIMETHYL-ETHYL)							IPUR 942 / 50 J				
	2-PROPENAMIDE, N-											
	(1,1-DIMETHYL-3-OXOBUTYL)							IPUR 933 100 J				

[illegible]

W/2752:GM 35WJ

[illegible]

0313130 3000 /1534

SITE: CHEM WASTE
CASE M012363/M

SAMPLE NO:	M01309	M01309/ M01309PA	M01310	M01312	M01313	M01315/ M01315PA	M01317/ M01317PA/PE	M01318	M01320/ M01320PA	M01321	M01322
SAMPLE LOCATION:	WELL MW-14R	WELL MW-23R	WELL P-10	WELL MW-16R	MAVERS CREEK	WELL L-27	WELL L-20	WELL L-21	WELL L-29	WELL L-31	WELL L-39
SAMPLE TYPE:	GV-LOW	GV-LOW	GV-MED	GV-LOW	GV-LOW	GV-LOW	GV-LOW	GV-LOW	GV-LOW	GV-LOW	GV-LOW
PCB											
CHLORO 2-4-S 7 HEPB											
PHOS NONE DETECTED HEPB											
BIOVIN/ NONE DETECTED FIRAN											
TOTAL METALS											
ALUMINIUM	93	112	282	92	2050	1670	3510	3280	850	2730	3630
ANTIMONY											
ARSENIC		24.1									
BARIUM		6	160		41	63	62	69	58	53	61
BERYLLIUM											
CADMIUM			0.5					1.5			
CALCIUM	575000	1060000	1310000	610000	81700	139000	947000	599000	169000	154000	203000
CHROMIUM						120	40	301	11	30	45
COPALT											
COPPER	10	9	9			34	40	44	15	19	20
IRON	1390		229	659	2320	7460	6100	6720	1440	4540	4860
LEAD						11		5		6.1	3.9
MAGNESIUM	147000	350000	474000	158000	29500	55100	386000	363000	65400	134000	129000
MANGANESE	18	14	9	20	35	479	3290	497	174	44	150
MERCURY											
NICKEL						102	89	332			44
POTASSIUM	10400	54500	95340	12900	3440	3110	4710	2750	922	2350	2500
SELENIUM											
SILVER											
SODIUM	56400	965000	1680000	64300	15300	18900	1010000	77700	14900	55000	39400
THALLIUM											
TIN											
VANADIUM											
ZINC						41	25	99		17	17
PIS METALS											
ALUMINIUM	185	188	231	115	235	179	143	189		117	62
ANTIMONY											
ARSENIC											
BARIUM			16		36	20	31	50	38	35	24
BERYLLIUM			6		2			2		4	
CADMIUM								0.7			
CALCIUM	553000	932000	1490000	504000	90000	114000	899000	575000	156000	164000	168000
CHROMIUM											

DATE: 01/23/73
TIME: 11:00

SAMPLE NO.	SAMPLE LOCATION	SAMPLE TYPE	COPPER	IRON	LEAD	MANGANESE	MERCURY	NICKEL	PTASMUM	SILVER	SODIUM	TALLIUM	TIN	UNADRIUM	ZINC	ARSENIC	CHLORIDE	FLUORIDE	NITRATE NITROGEN	NITRITE NITROGEN	POB	POY	SULFATE	SULFIDE	TOC	TOTAL PHENOLS	TOX
MOB100/	WELL MU-140	GW-LON	12	1300		134000	18	10200	2530		51100					56000	1600000	3400000	36000	1400000	8000	3400	1820000	42000	3400	120	
MOB100/	WELL MU-230	GW-LON	8			372000	15				1050000						1600000	3400000	36000	1400000		3400	270000	356000	1100	120	
MOB110	WELL P-10	GW-MED				503000	7				1880000				15		3800000	1400000				18400	2800000	780000	1200	750	
MOB112	WELL MU-140	GW-LON	8	576	8.7	151000	20	12800			60000					100000					126	1460000	1460000	158000	2300	13	
MOB113	WELLS COSEX	GW-LON		160		33600	15	3440			16000					28000					16	106000	106000	158000	6400	24	
MOB115/	WELL L-27	GW-LON	15	42		46300	316	2730			15000					35000					118	150000	1260000	52000	37000	433	
MOB117/	WELL L-20	GW-LON		559		420000	3400	57			1080000					2240000					20	1260000	1260000	52000	37000	433	
MOB118	WELL L-21	GW-LON		48		331000	426	304			73000					710000					70	755000	755000	12000	12000	53	
MOB120/	WELL L-29	GW-LON		12		64700	139				14400					20000					17	275000	660000	660000	1200	28	
MOB121	WELL L-31	GW-LON		24		141000	15	2290			57900					18000					64	420000	420000	676000	2500	24	
MOB122	WELL L-39	GW-LON		51		118000	6	1410			37400					70000					22	355000	129000	3500	3500	24	

SITE: CHEM WASTE
CASE NO: 2343/H

SAMPLE NO:	NOB123/ NOB123DE	NOB124 WELL T-19	NOB125 WELL T-24	NOB126 WELL T-24	PCVD
SAMPLE LOCATION:	GH-LOW	GH-LOW	GH-LOW	GH-MED	
SAMPLE TYPE:					

UNKNOWN SULFUR COMPOUND					
UNKNOWN ALICYCLIC					
UNKNOWN SULFUR COMPOUND					
UNKNOWN ALIPHATIC					
UNKNOWN SULFUR COMPOUND					
UNKNOWN ALIPHATIC					
UNKNOWN SULFUR COMPOUND					
UNKNOWN ALIPHATIC					
UNKNOWN SULFUR COMPOUND					
UNKNOWN AROMATIC					
UNKNOWN SULFUR COMPOUND					
UNKNOWN AROMATIC					
UNKNOWN SULFUR COMPOUND					
UNKNOWN ALIPHATIC COMPOUND					
UNKNOWN ALIPHATIC COMPOUND					
UNKNOWN ALIPHATIC COMPOUND					
UNKNOWN ALIPHATIC COMPOUND					
UNKNOWN ALIPHATIC COMPOUND					
UNKNOWN ALIPHATIC					
UNKNOWN NITROGEN COMPOUND					
UNKNOWN ALKANE					
UNKNOWN ALKENE					
UNKNOWN ALKYL ISOCYANATES					
UNKNOWN ALKYLAMIDE	20 1/20			900	
UNKNOWN ALKYLAMINE	1/30 101				
UNKNOWN ALKYLAMINE					
UNKNOWN ALKYLAMINE					
UNKNOWN ALKYLAMINE					
UNKNOWN ALKYLAMINE					
UNKNOWN CARBOXYCYCLIC ACID					
UNKNOWN CARBOXYCYCLIC ACID				900	
UNKNOWN CYCLIC ALCOHOL					
UNKNOWN HYDROCARBON					
UNKNOWN MONOCHLORINATED					
UNKNOWN AROMATIC					
UNKNOWN PHOSPHOROTHIOIC					
UNKNOWN ACID ESTER				2000	
UNKNOWN PHOSPHOROTHIOIC					
UNKNOWN ACID ESTER				20000	
UNKNOWN PHOSPHOROTHIOIC ACID				1000	
UNKNOWN PHOSPHOROTHIOIC ACID					
UNKNOWN SUBSTITUTED PHENOL				900	
UNKNOWN SUBSTITUTED PHENOL				5000	
UNKNOWN SULFUR COMPOUND				20000	
UNKNOWN SULFUR COMPOUND					
UNKNOWN ALKYLAMIDE					
UNKNOWN Y-CARBONBENZONIC ACID					

PEST/ NONE DETECTED

SITE: CHEN WASTE
CASE NO: 2363/H

SAMPLE NO:	NOB221/ NOB221DE WELL 1-19 CV-LOW	NOB224 WELL 1-19 CV-LOW	NOB225 WELL 1-24 CV-LOW	NOB226 CW-MED
SAMPLE LOCATION:				PCV D
SAMPLE TYPE:				

PCB

CHLORO 2-4-5 T					940
HEPB					

PHOS NONE DETECTED					
HEPB					

BIDVIN/ NONE DETECTED					
FURAN					

TOTAL ALUMINIUM		1460	491	466	417
METALS ANTIMONY					29
ARSENIC		7.1			1230
BARIUM		104	52	14	84
BERYLLIUM					

CADMIUM				0.8	2
CALCIUM		696000	22800	261000	623000
CHROMIUM		12	22	13	10
CORAL T					21
COPPER		17	14		49

IRON		2320	1290	1160	1710
LEAD					
MAGNESIUM		227000	98800	151000	288000
MANGANESE		2120	90	158	619
MERCURY					

NICKEL		175	281	71	103
POTASSIUM		6220	1860	6340	150000
SELENIUM					11
SILVER					
SODIUM		945000	47000	40900	514000

THALLIUM					
TIN					
UANIUM					
ZINC		14		367	69

BIS ALUMINIUM		185	74	178	237
METALS ANTIMONY					8.2
ARSENIC					1430
BARIUM		85	39	15	88
BERYLLIUM				6	4

CADMIUM		13			
CALCIUM		649000	210000	205000	666000
CHROMIUM					

SITE: CHEM WASTE
CASE NO: 2363/M

SAMPLE NO:	MDP121/ MDP121PE	MDP124	MDP125	MDP126
SAMPLE LOCATION:	WELL T-19	WELL T-19	WELL T-24	WELL T-24
SAMPLE TYPE:	CU-LOW	CU-LOW	CU-LOW	CU-MED
COPALT				20
COPPER	11			41
IRON	212		97	1470
LEAD	49	14	39	
MAGNESIUM	218000	97000	174000	208000
MANGANESE	2280	65	157	497
MERCURY				
NICKEL	177	201	50	124
POTASSIUM	4430	3520	7440	233000
SELENIUM				
SILVER				
SODIUM	1080000	43400	53000	653000
THALLIUM				
TIN				
WOLFRAMIUM				
ZINC	24		320	44
IMIDE, BROMIDE				
INDIC, CHLORIDE	775000	18000	14000	900000
CYANIDE				125
FLUORIDE				
NITRATE NITROGEN	400			
NITRITE NITROGEN				
POC	280	24	36	114
POV		14		22
SULFATE	250000	233000	1050000	1000000
SULFIDE		178000	514000	34000
TOC	13000		1400	1000000
TOTAL PHENOLS				81300
TOV	189	15	450	41400

APPENDIX G
TCLP SAMPLING

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

DATE: September 16, 1987

SUBJECT: Land Ban Rule Inspection - Chemical Waste Management Inc.,
Vickery, Ohio (C28361)

FROM: Philip E. Gehring *PE*
THRU: A. R. Winklhofer, chief, EDO

TO: Craig Liska, 5HE

In response to a Priority I request from Craig Liska, 5HE, a Land Ban Rule (LBR) Inspection was performed at the subject facility on April 14, 1987. The purpose of the inspection was to determine possible limitations to land disposal of materials now stored at Chemical Waste Management Inc., Vickery, Ohio (CWM-V). These limitations would be imposed pending LBR regulations anticipated to become effective in 1988. The LBR also specifies a new test procedure, "Toxicity Characteristic Leaching Procedure" (TCLP). Special sample collection procedures specified in the TCLP were employed for this inspection.

CWM-V is anticipating the land disposal of contaminated pond sludges from previous on-site operations. These pond sludges are being stored in a large plastic covered mound pending completion of the intended disposal cell and Ohio EPA and U. S. EPA approvals for disposal. Closure plans must also be similarly approved. At the time of this inspection there was considerable storm damage to the plastic cover of the waste mound, exposing the stored wastes. The facility was actively working toward recovering the mound.

Earthen dikes around the mound catch run off from the plastic covering and leachate from under the covering. These liquids flow into a pond to the east of the covered waste mound. The facility periodically pumps these waters to another larger pond for settling prior to deep well injection. The entire area around the waste mound and adjacent pond is posted as a hazardous waste area.

Mr. Craig Liska of the Region V Waste Management Division, also a member of the Hazardous Waste Ground Water Task Force (HWGWTF) requested a modified TCLP analysis of the liquids leaching from the waste mound and those in the pond adjacent to the waste mound. This request was assigned a Priority I for sampling only with a completion date of April 15, 1987. Analysis of the samples for TCLP limited parameters was requested. Additional parameters were also requested including TOC.

Samples were collected as requested on April 14, 1987. The sampling and inspection team consisted of Mr. Craig Liska, 5HE, Mr. Philip E. Gehring, 5SEDO, Mr. David Petrovski, 5SPT, and Mr. Mark Lewis, Alliance Technology Corp. (EPA-HWGWTF Contractor). Mr. James Doyle, CWM-V was the facility observer. Sample sites were selected by Mr. Liska and Mr. Petrovski

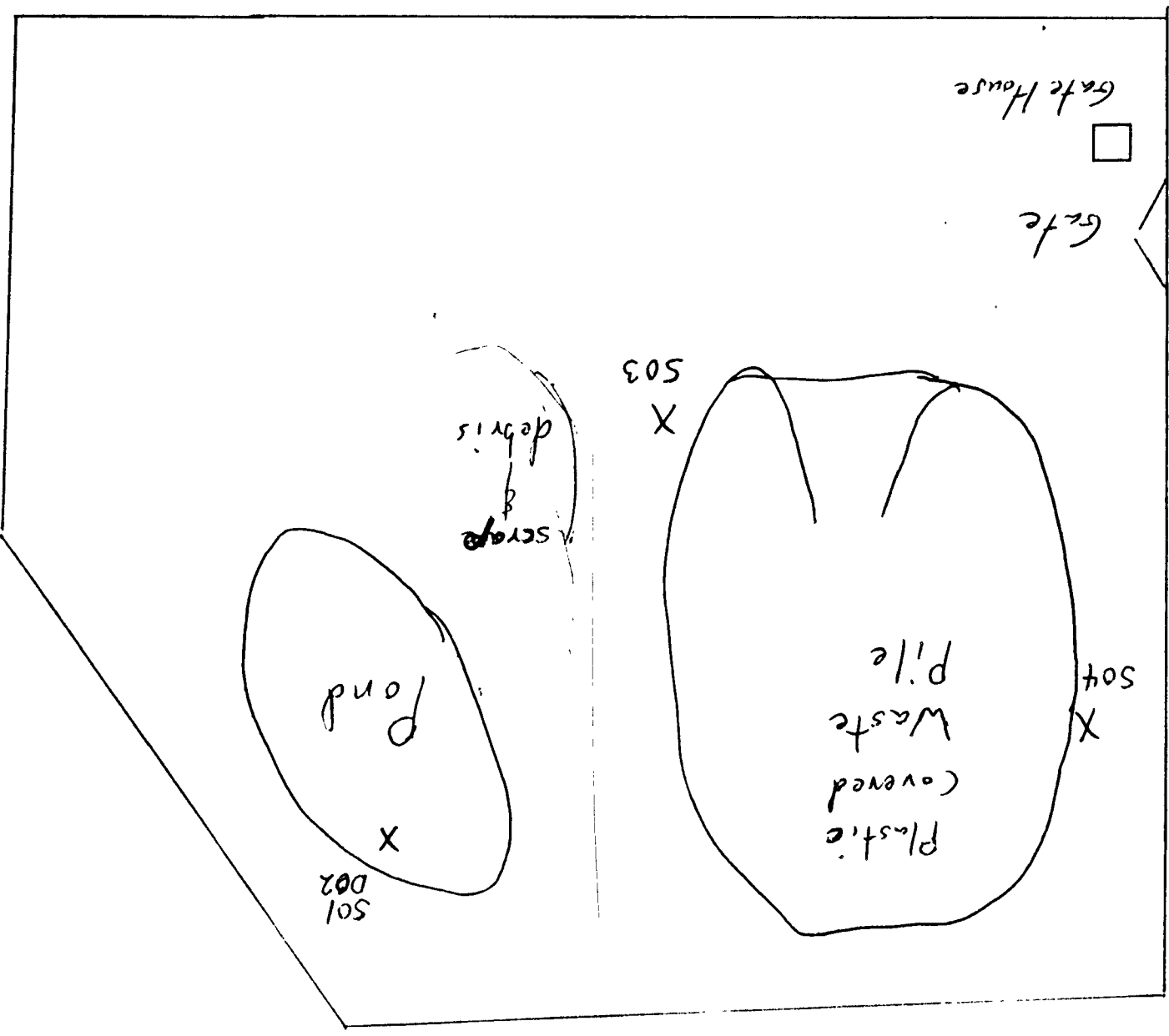
after a complete inspection of the waste mound area. Three sites were selected including one from the pond and two from active leachate sites at the base of the waste mound. The attached diagram indicates the approximate location of the sample sites. Photographs were taken to further document the nature of the sample sites. The photographs were taken by Mr. Dave Petrovski. Special procedure requirements for TCLP sampling, transportation, and preservation were followed. The sampling methods used are referenced in "Characterization of Hazardous Waste Sites, A Methods Manual, Volume II - Available Sampling Methods." Specific TCLP sampling and analysis requirements for volatile organic compounds are referenced in Appendix I to 40 CFR Part 268 TCLP. The sampling requirements in this document were met by collecting liquid samples into a "Tedlar" bag. This was accomplished by filling a clean clear glass jar with sample liquid and transferring the sample liquid to the "Tedlar" bag. After filling the bag was exhausted of all air and sealed. The sampling method was used at all three sample sites using a dedicated glass jar for each site. TOC samples were collected into a plastic 250 ML container.

A duplicate sample was collected at the pond site. Sample numbers were 87EG11S01 and 87EG11D02. This first leachate site southeast of the waste mound was sampled from an existing pond of leachate. This sample was designated as 87EG11S03. The leachate site west of the waste mound was sampled from a ponded area which was constructed to catch a seepage flow about 3.5 hours prior to sample collection. This sample was designated as 87EG11S04. A blank sample was made up using HPLC water which was poured directly from the commercially supplied bottle into the "Tedlar" bag. This sample was made up immediately outside the posted area around the waste mound, at the southwest entrance gate used to entrance and exit the area. The blank sample was designated as 87EG11R05. Standard samples for the HWGWF were also collected at the S01 site, MQB sample number 326, and at the S03 site, MQB sample number 306. Completed samples were passed over the fence to EPA or Alliance personnel for transport back to the onsite trailer. Samples for TCLP analysis were iced and driven to the EDO. Samples were then packaged for hazardous waste requirements and shipped to the contract laboratory, Cambridge Analytical Associates of Boston, Massachusetts on April 20, 1987. Data was received at CRL on June 1, 1987 and finally arrived at EDO on August 24, 1987.

Results of the requested TCLP analyses are presented on table I. Data for the blank sample were all less than detectable except for methylene chloride. Samples S01 and D02 were diluted tenfold before analysis and samples S03 and S04 were diluted 50 times. The blank sample was not diluted. Values reported for chlorobenzene appear to exceed limits of the LBR as listed in Appendix II to 40 CFR Part 268. TOC data was received at EDO on September 8, 1987. Results are presented on Table II. Dilution factors used for TOC analysis were 5X for sample Nos. D02 and S04, 10X for S01, and 20X for S03. Copies of raw TOC data sheets are enclosed.

Questions regarding the field activities related to this inspection should be addressed to Philip E. Gehring at FTS 942-7260.

X
Blank
ROS



Chemical Waste Management
Vickery, Ohio
Hazardous Waste Pile Sample S
April 14, 1987
Philip E. Gehring
Drawing not to scale



00250

Cambridge Analytical Associates

1106 Commonwealth Avenue / Boston, Massachusetts 02215 / (617) 232-2207

TOC RESULTS
SAS 2877E



Cambridge Analytical Associates

1106 Commonwealth Avenue / Boston, Massachusetts 02215 / (617) 232-2207

00259

SAS 2877E

SAMPLE ID	LAB ID	ug/ml TOC	% RECOVERY
E 2508	8704160-01	833	NA
E 2509	8704160-04	820	NA
E 2510	8704160-05	8460	NA
E 2511	8704160-06	3800	NA
E 2513	8704160-07	42.0	NA
Method Blank	8704160	42.0	NA
E 2508 Spike ^A	8704160-02	984	99.5 ^A
E 2508 Spike ^A Dupl.	8704160-03	1010	110 ^A
WP1284	standard 1	92.1	100.3 ^B
WP1284	standard 2	91.7	99.9 ^B
			run 4/22/87

^A Spike = 1.5 mls of 2000 ug/ml stock spiked into 10 mls sample, volume = 11.5 ml.
total ug = 3000.

^B Expected value WP1284-4 = 91.8 ug/ml TOC

TOC ug/ml

[illegible]

4/27/87

8104160

4/22/87 LSM

1 TOC 94.36

2 TOC 94.54

BIX

3 TOC 94.603

4 TOC 94.691

5 TOC 94.792

6 TOC 94.824

1 TOC 12.15

2 TOC 11.38

3 TOC 11.26

4 TOC 14.52

5 TOC 11.39

1 TOC 103.1

2 TOC 103.8

3 TOC 103.3

4 TOC 103.6

1 TOC 402.2

2 TOC 401.9

3 TOC 401.5

4 TOC 402.0

1 TOC 793.4

2 TOC 793.7

3 TOC 795.6

4 TOC 795.0

wp1284-4 std 1

1 TOC 95.53

2 TOC 95.61

3 TOC 95.75

TOC

1 TOC 1.251

2 TOC 1.261

3 TOC 1.367

4 TOC 0.457

1 TOC 0.412

2 TOC 0.596

3 TOC 0.483

4 TOC 0.412

5 TOC 0.603

1 TOC 63.45

2 TOC 63.71

3 TOC 65.73

4 TOC 65.56

1 TOC 107.6

2 TOC 106.6

3 TOC 106.6

4 TOC 106.5

1 TOC 1530
OVERRANGE ERROR 10%

1 TOC 753.4

2 TOC 757.2

3 TOC 753.2

1 TOC 424.0

2 TOC 423.3

3 TOC 424.5

4 TOC 421.2

1 TOC 1.784

2 TOC 1.388

3 TOC 1.295

4 TOC 1.445

5 TOC 1.557

1 TOC 103.3

2 TOC 101.7

3 TOC 100.3

4 TOC 101.4

1 TOC 104.4

2 TOC 104.2

3 TOC 103.5

4 TOC 104.0

1 TOC 0.411

2 TOC 0.481

3 TOC 0.605

4 TOC 0.641

1 TOC 94.86

2 TOC 94.75

3 TOC 95.16

4 TOC 95.33

00253

-05%

-07

-01392 1/10

-01392 1/10

104.025

BIX

0.5345

wp1284-4 std 2

95.05

0.7775

1000%

12.124

10000%

108.75

4000%

401.9

8000%

795.925

BIX

0.502

-01 1/10

86.7275

-03 2/10

166.875

-05 2/10

-06 2/10

758.525

Student's Name

8704160

Date 7/22/87

Subject

TOL

Instructor's Name

ESM

00254

Sample	$\mu\text{g/ml TOL}$	dil	$\mu\text{g/ml TOL}$
wp1284-4	92.1	1x	92.1
Blank	12.0	10x ^{EDM} 1x	12.0
8704160-01	83.3	5x ^{EDM} 10x	833
-04	164	5x	820
-06	761	15x	3,800
-05	423	20x	8,460
-07	12.0	1x	12.0
-02 (olspk)	98.4	10x	984
-03 (olspk dup)	101	10x	1010

100.3% rec.

spk = 1.5 mls of 2,000 $\mu\text{g/ml C}$ to 10 mls sample (tot. vol. = 11.5 mls) = 3,000 $\mu\text{g C}$

$$8704160-01 = 833 \mu\text{g/ml C} \times 10 \text{ mls} = 8,330 \mu\text{g}$$

$$-02 = 984 \mu\text{g/ml} \times 11.5 \text{ mls} = 11,316 \mu\text{g}$$

$$11,316 \mu\text{g} - 8,330 \mu\text{g} = 2,986 \mu\text{g}$$

$$2,986 \mu\text{g} \div 3,000 \mu\text{g} \times 100 = 99.5\% \text{ recovery}$$

$$-03 = 1010 \mu\text{g/ml} \times 11.5 \text{ mls} = 11,615 \mu\text{g}$$

$$11,615 \mu\text{g} - 8,330 \mu\text{g} = 3,285 \mu\text{g}$$

$$3,285 \mu\text{g} \div 3,000 \mu\text{g} \times 100 = 110\% \text{ recovery}$$

cont. → Sample	$\mu\text{g/ml TOL}$	dil	$\mu\text{g/ml TOL}$	
Blank	12.0	1x	12.0	
wp1284-4	91.7	1x	91.7	99.9%

Expected value wp1284-4 = 91.8 $\mu\text{g/ml TOL}$

from analyst's notebook

TABLE I

Chemical Waste Management-Vickery
Volatile Organics
April 14, 1987

Lab. Sample No. EDO Sample No. 87EG11 -	E2508 S01	E2509 D02	E2510 S03	E2511 S04
<u>Requested Parameters</u>				
Methylene Chloride ug/L	20JB	20JB	200JB	2400JB
Carbon Disulfide	50U	50U	250U	250U
2-Butanone	100U	100U	500U	500U
1,1,1- Trichloroethane	50U	50U	250U	250U
Carbon Tetrachloride	50U	50U	250U	250U
Trichloroethene	50U	50U	250U	250U
1,1,2 - Trichloroethane	50U	50U	250U	250U
Benzene	50U	50U	250U	250U
Tetrachloroethene	50U	50U	250U	250U
Toluene	50U	50U	200J	100J
Chlorobenzene	50U	50U	670	630
Trichlorofluoromethane	100U	100U	500U	500U
1,1,2 - Trichloro - 1,2,2 - Trifluoroethane	100U	100U	500U	500U
2- Nitropropane	100U	100U	500U	500U
Isobutanol	250J	190J	15,000	11,000
1,2 - dichlorobenzene	100U	100U	310J	500U
<u>Non requested Parameters</u>				
Acetone			17,000	7,000
4- Methyl-2-pentanone			1,200	940
Chloroform				80J

B- found in blank (80ug/L); U- Undetected at level specified; J- Estimated Concentration below detection limits.

TABLE II

Chemical Waste Management-Vickery

TOC

April 14, 1987

Lab. Sample No.	E2708	E2709	E2710	E2711	
EDO Sample No. 87EG11 -	S01	D02	S03	S04	R05
<u>Requested Parameters</u>					
TOC ug/ml	833	820	8460	3800	2.0u

u - undetected at level specified