

EPA-700/8-88-047

## Ground-Water

Evaluation Of Land  
Reclamation, LTD ,  
Racine, Wisconsin

n, Ltd.

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ENVIRONMENTAL PROTECTION AGENCY

SIN  
RESOURCES



May 1988

EPA-700/8-88-047

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# Hazardous Waste Ground-Water Task Force

## Evaluation of Land Reclamation, Ltd. Racine, Wisconsin



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY



STATE OF WISCONSIN  
DEPARTMENT OF NATURAL RESOURCES

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MAY 1988

UPDATE OF THE HAZARDOUS WASTE GROUND-WATER

TASK FORCE EVALUATION OF LAND RECLAMATION, LTD.

The United States Environmental Protection Agency's (U.S. EPA) Hazardous Waste Ground-Water Task Force, in conjunction with the Wisconsin Department of Natural Resources (WDNR), conducted an evaluation at the Land Reclamation, LTD. (LRL) hazardous waste disposal facility. Land Reclamation, LTD. was one of 58 hazardous waste treatment, storage and disposal facilities investigated by the Task Force nation-wide. 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) ground-water monitoring regulations, and whether the ground-water monitoring systems in place at the facilities are capable of detecting contaminant releases from waste management units. Land Reclamation, LTD. is located near Racine, Wisconsin. The on-site inspection was conducted from August 4 through August 8, 1986.

This update of the Task Force evaluation summarizes salient actions concerning the facility subsequent to the field inspection.

On September 23, 1986, a Comprehensive Monitoring Evaluation (CME) was conducted at LRL. The CME consisted of an on-site ground-water inspection, conducted September 23, 1986, and a treatment, storage, and disposal (TSD) facility inspection conducted on October 1, 1986. The findings of the ground-water inspection were in agreement with the Task Force findings. The TSD inspection found violations regarding the installation of perimeter drainage structures, the inspection schedule, and facility access control.

On January 13, 1987, a memo from Region V, William Muno, HWEB, and Karl Bremer, SWB to Thomas Geishecter, ERRB in U.S. EPA Headquarters recommended that LRL be nominated to the National Priorities List because of potential hazards and LRL's noncompliance with RCRA. However, in November 1987, LRL sent a letter to William Muno as a result of an October 8, 1987 meeting with LRL, U.S. EPA, and WDNR expressing a willingness to negotiate a corrective action order under RCRA. The Order is currently being drafted. As a result of the letter, action to put LRL on the National Priority List (NPL) has ceased at this time.

On February 23, 1987, the Wisconsin Department of Justice amended the previous complaint (see text of report) to incorporate numerous incidents where LRL initiated construction activities without prior WDNR approval.

LRL submitted a RCRA closure plan on January 27, 1987, which was denied by the WDNR. A resubmitted (August 13, 1987) closure plan is being reviewed by the WDNR pursuant to NR 181.42(8)(d). The WDNR on December 16, 1987 proposed extensive modification to LRL's RCRA monitoring program in a draft closure and Long-Term Care Plan approval letter. The WDNR approved LRL's closure plan on March 31, 1988.

On August 4, 1986, the Wisconsin Department of Justice filed suit against LRL in Racine County Circuit Court. The complaint alleges numerous violations of the State's hazardous waste, solid waste, and surface water pollution regulations. Hazardous waste violations cited pertain to closure and ground-water monitoring. Specific ground-water violations include: 1) not sampling for all parameters given in NR 181.49(5)(a) (40 CFR Part 265, Appendix III, EPA Interim Primary Drinking Water Standards), 2) not establishing background concentrations within the first year of monitoring, 3) not conducting an annual evaluation of well locations based on ground-water flow direction, 4) not submitting the results of statistical evaluations, 5) failure to stabilize the south slope, as required by NR 181.42(8)(a), and 6) inaccurate inspection logs, as required by NR 181.42(7)(d). Other action concerning LRL included the following notices of noncompliance (NON) or notices of violation (NOV):

<u>DATE</u>	<u>ACTION</u>	<u>CITATION</u>
8/13/86	NON	: Constructing Hazardous Waste (NR 181) Closure Structure without approval
8/26/86	NOV	: Wastewater Discharge Permit Violations
9/23/86	NON	: NR 180 Daily cover and vegetative stress
10/15/86	NON	: NR 180 Leachate seeps and vegetative stress
10/20/86	NOV	: Access control, ground-water data evaluation Perimeter drainage control, and inspections
12/3/86	NON	: Wind blown paper, leachate seeps and access control
2/17/87	NOV	: Failure to properly cover waste, constructing NR 181 Physical/hydraulic barrier without approval
5/11/87	NOV	: Wind blown paper

LRL has constructed a sedimentation basin and run-off drainage system to collect run-off from this site. This construction has resulted in the rechannelling of Gunderson Canal so it flows away from the site. Damage to this new drainage system along the south side of the site has allowed leachate seeps to flow away from the sedimentation basin and off site. This damage has also destroyed a number of wells in both the RCRA and State Solid Waste ground-water monitoring networks.

LRL has acknowledge, after testing, the leachate collection system in Corridor 4 is not free flowing. An attempt to clean out leachate from the system indicated a blockage.

Solid waste is presently being disposed of in Corridor 7. Before commencing disposal in this corridor a physical/hydraulic barrier was constructed separating Corridor 7 from Corridor 1-6.

Since the Task Force inspection, the site has been annexed by the city of Racine. Also, significant residential and commercial development has taken place around the site. Additional apartments have been constructed directly east of the hazardous waste unit and a new commercial shopping center has been constructed south of the site.

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

GROUND-WATER MONITORING EVALUATION  
LAND RECLAMATION, LTD.  
RACINE COUNTY, WISCONSIN

MAY 1988

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## 1. EXECUTIVE SUMMARY

### A. INTRODUCTION

Concerns have recently been raised as to whether the commercial hazardous waste treatment, storage, and disposal facilities are in compliance with the ground-water monitoring requirements promulgated under the Resource Conservation and Recovery Act (RCRA)\*. Specifically, the concerns focus on the ability of ground-water monitoring systems to detect contaminant releases from waste management units at these facilities. In response to these concerns, the Administrator of the United States Environmental Protection Agency (U.S. EPA) established a Hazardous Waste Ground-Water Task Force (Task Force) to evaluate the level of compliance at these facilities and address the cause(s) of noncompliance. The Task Force comprises personnel from U.S. EPA Headquarters, U.S. EPA Regional Offices, and State regulatory agency personnel.

#### 1. OBJECTIVES

To determine the status of facility compliance, the Task Force is conducting indepth facility investigations, including on-site inspections with the following objectives.

- ° Determine compliance with interim status ground-water monitoring requirements of 40 CFR Part 265 as promulgated under RCRA and Wisconsin Administrative Code, Section NR 181.49(5).
- ° Evaluate the ground-water monitoring program described in the facilities' RCRA Part B permit applications for compliance with 40 CFR Part 270.14 (c) and potential compliance with 40 CFR 264 Subpart F, Wisconsin Administrative Code Section NR 181.49(6).

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

- ° Determine if the ground-water at the facility contains hazardous wastes or hazardous waste constituents.
- ° Verify the quality of the company's ground-water monitoring data and evaluate the sampling and analytical procedures.
- ° Provide information to assist the Agency in determining if the facility meets EPA ground-water monitoring requirements for waste management facilities receiving waste from response actions conducted under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, Public Law 91-510). \*

To address these objectives, each Task Force investigation will determine if:

- ° The facility has developed and is following an adequate ground-water sampling and analysis plan;
- ° RCRA (and/or State-required) monitoring wells are properly located and constructed:
- ° required analyses have been conducted on samples from the designated RCRA monitoring wells; and
- ° the ground-water quality assessment program outline (or plan, as appropriate) is adequate.

\* "Procedures for Planning and Implementing Off-Site Response Action"; Federal Register, Vol. 50, No. 214, Page 459-463, November 5, 1985.

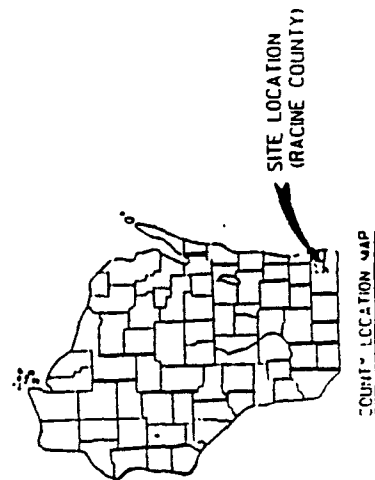
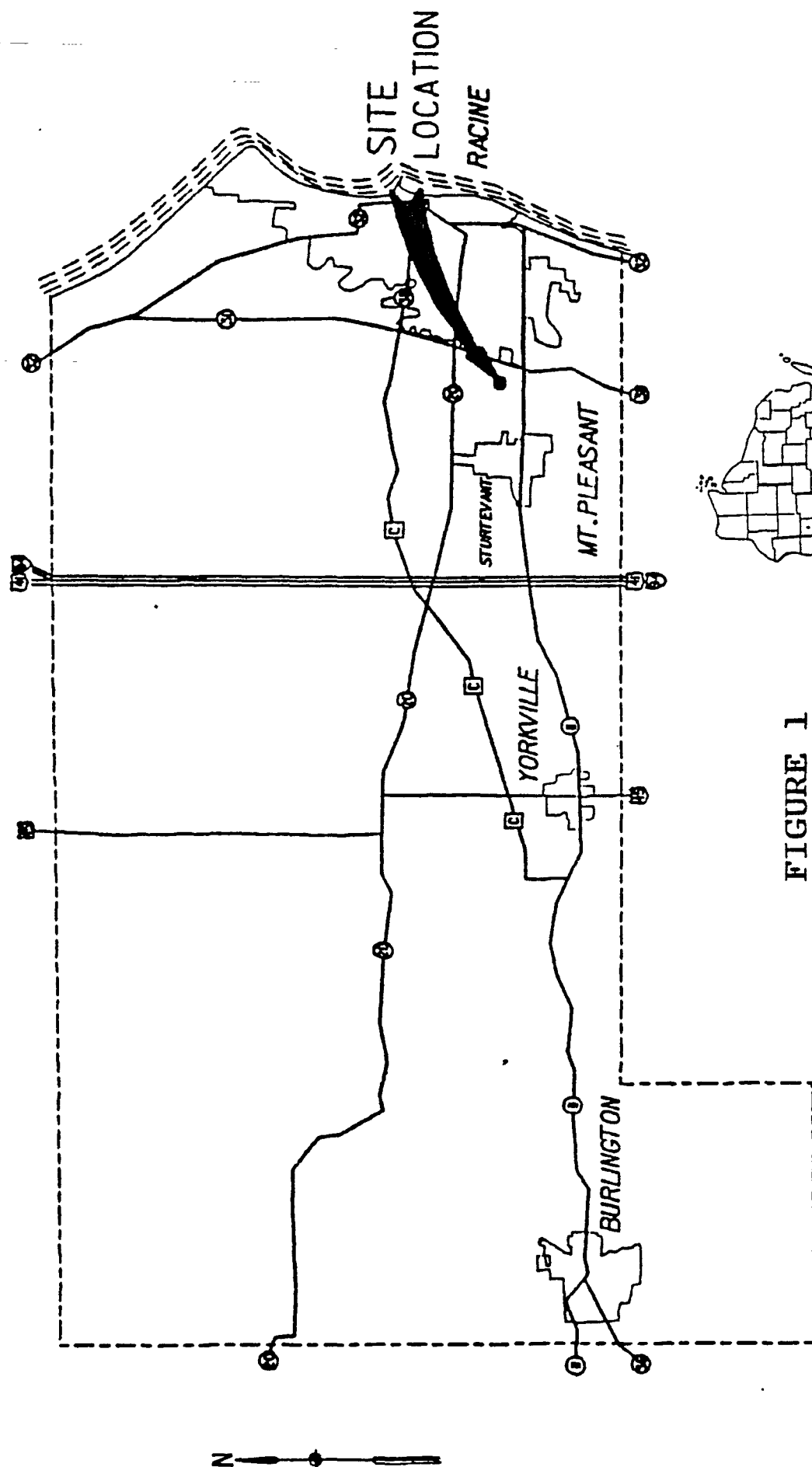
## 2. BACKGROUND

The thirtieth facility investigated by the Task Force was the Land Reclamation, LTD. (LRL) facility, located near Racine, Wisconsin (FIGURE 1). The LRL facility is a family-owned waste management company that operates a solid waste landfill at this site. The on-site inspection was conducted from August 4 through August 8, 1986, and was coordinated by personnel from the U.S. EPA, Region V, Central District Office. Representatives of the Wisconsin Department of Natural Resources (WDNR), U.S. EPA Headquarters, and U.S. EPA Region V's RCRA Enforcement Section also participated in the inspection. The investigation, in general, involved review of State, Federal and facility records, the facility inspection, laboratory evaluation, and ground-water sampling and analysis.

### a) History of Site

The LRL landfill is on an 81 acre site, near Racine, in the town of Mt. Pleasant, Racine County, Wisconsin. The site is located on a north-south ridge, known as the inner Lake Border Moraine, approximately ranging in elevation from 720 feet on the eastern side of the site, to 680 feet on the western side. Gunderson Canal, an intermittent creek, drains to the Pike River and is located on the western side of the ridge of the site property. State Route 31 (South Green Bay Road) is located approximately 1/4 mile east of the site.

In 1963, the city of Racine leased the southwest corner of the site for municipal waste disposal. The Racine Department of Public Works operated the site for use by residents and the city. Commercial waste haulers were not permitted to use the facility. Waste disposed of consisted primarily of residential solid waste and incinerator ash from the city-owned incinerator. On occasions, foundry sand was used as cover material, and at least one local industry, indicated in its RCRA notification, that it sent hazardous waste to this site in the 1960's.



**FIGURE 1**  
**SITE LOCATION MAP**  
APPROX. SCALE: 1"=3 MILES.



LRL assumed operation of the city of Racine landfill in August 1970, and expanded operations to the eastern portion of the site. This portion of the site was constructed in phases called corridors. At the time of the inspection, six corridors either were filled or in use. A seventh corridor was under construction, but did not contain any waste. Waste defined as hazardous and toxic was first noted as being disposed of at the site in June of 1973.

b) Adjacent Land Use

LRL is located in an area consisting of a mix of residential, commercial, and light industrial development. A multi-family rental development is being constructed on contiguous property, east of the facility. Single family residences are located to the north and northeast with a small subdivision also located to the south of the property. A mix of private and public water supply systems service these residential areas. Development plans call for continued extension of public water supply in the region.

A regional shopping center is located southeast of the property. Development plans call for expansion of this commercial complex to property adjacent to the southern boundary of the facility. Extension of an existing public street (21st Street) is proposed contiguous to the south property boundary. At the time of the inspection, the facility was located in the Village of Mt. Pleasant. Subsequent development have resulted in significant portions of LRL operations and adjacent properties being annexed to the city of Racine. Within 1/2 mile of the site, are located a high school, grade school, and Senior Citizens Housing Complex.

Open land contiguous to the north of the facility is being proposed by LRL as an expansion to the existing 81 acres site. A sand and gravel operation and utility substation are on land contiguous to the west of the facility. Manufacturing industries are located southwest of the facility.

c) State/Federal Requirements

LRL must meet the requirements for ground-water monitoring near hazardous waste landfills given in Wis. Adm. Code Section NR 181.49 (Groundwater and Leachate Monitoring Standards) (40 CFR Part 264, Subpart F and Part 265, Subpart F); Section NR 181.44 (Landfill and Surface Impoundment Standards), Wis. Adm. Code (40 CFR 265 Subpart N) and Sections NR 181.44 (12) and Section NR 181.42(8) and(9) (Closure and Long Term Cure) (40 CFR 265 Subpart E). In addition, further state requirements are found in Chapter 140 and Chapter 180 of Wis. Adm. Code.

On August 19, 1980, LRL filed a notification of hazardous waste activity for its land disposal facility with U.S. EPA. On November 19, 1980, LRL filed Part A of the permit application with U.S. EPA, and thus obtained interim status. On December 10, 1982, WDNR denied LRL an interim license under Ch. NR 181, Wis. Adm. Code, and required LRL to stop accepting hazardous waste. The license was denied because LRL did not meet the minimum requirements for interim license under NR 181.42 and NR 181.44 and NR 181.53 Wis. Adm. Code. (The WDNR's denial was upheld by the Wisconsin Circuit Court in July 1983). The denial ordered LRL to close the corridors containing hazardous waste, (Corridors 1 through 4), by June 1983. This had not been completed at the time of the inspection.

On December 19, 1984, WDNR issued a Conditional Plan of Operation Approval for solid waste disposal under Ch. NR 180, Wis. Adm. Code. The approval, among other things, required LRL to submit plans for a containment structure to be constructed on the south side of the landfill to intercept leachate and ground-water which was leaving the site. At the time of the inspection, LRL had not submitted plans for the containment structure. Numerous conceptional design proposals had been prepared by LRL, but did not meet requirements needed for the WDNR approval.

LRL opted not to pursue obtaining a final RCRA permit for operating a hazardous waste landfill and has not submitted a Part B permit application. LRL did not certify compliance with applicable ground-water monitoring and financial responsibility requirements by November 8, 1985. Although LRL submitted a closure plan on November 25, 1985, the plan did not specifically address closure requirements for the hazardous waste portions of the landfill.

As a result of inspections and record reviews, WDNR has issued a number of notices of noncompliance (NONs) and notices of violations (NOVs). In Wisconsin's enforcement strategy, NOVs are more serious than NONs. NOVs and NONs issued on the given date follow, with the violations cited are summarized below:

<u>DATE</u>	<u>ACTION</u>	<u>CITATION</u>
1973-79	NON	: Uncontrolled leachate seeps, windblown paper and inadequate daily cover
4/25/80	NON	: Failure to pay Waste Management fund fees
12/23/80	Proposed Order	: Requires LRL to submit an updated plan of Operation
2/25/81	NON	: Failure to pay Waste Management Fund Fees
4/7/81	U.S. EPA NOV	: Failure to distribute contingency plan to local authorities
5/6/81	NON	: Windblown paper, filling in unapproved areas, and failure to maintain leachate head levels
4/21/82	NON	: Failure to met solid waste (NR 180) Ground-Water Monitoring Requirements
8/26/82	NON	: Spreading leachate on exterior access road
10/7/82	NON	: Failure to meet hazardous waste (NR 181) Ground-Water Monitoring Requirements
10/19/82	NON	: Violation of hazardous waste (NR 181) Requirements
11/4/82	NOV	: Failure to maintain leachate levels and cut-back south scope

<u>DATE</u>	<u>ACTION</u>	<u>CITATION</u>
12/7/82	NON	: Notice to LRL to terminate leachate recirculation
8/9/83	NON	: Hazardous Waste (NR 181) Ground-Water and Leachate Monitoring Violations
2/27/84	NON	: Windblown paper, leachate seeps, and filling not in accordance with plan approval
4/10/84	NOV	: Leachate head maintenance, not filling in accordance with plan approval, maintenance of NR 181 Ground-Water discharge permit violations
10/31/84	NOV	: Failure to protect and lock wells, failure to maintain NR 181 Ground-Water Monitoring Network
12/6/84	NON	: Failure to properly abandon inoperable wells, accepting non-approved waste (Racine Sewage)
5/23/85	NON	: Failure to submit NR 180 and NR 181 Ground-Water Monitoring Results, failure to document well abandonment. Failure to comply with conditions of NR 180 Plan of Operation Approval
10/9/85	NON	: NR 181 Violations; inspections, maintenance of contingency plan, development training, development of closure plan, failure to perform Ground-Water Monitoring Data Evaluation
10/11/85	NOV	: NR 181 and NR 180 Plan of Operation Conditions
10/16/85	Proposed Special Order	: Required Methane Migration Study.

B. SUMMARY OF FINDINGS AND CONCLUSIONS

1. Compliance With Interim Status Ground-Water Monitoring - Wisconsin Administrative Code Chapter NR 181.49(5) (40 CFR 265 Subpart F)

a) §181.49(4) (§265.91) Ground-Water Monitoring System

LRL's present ground-water monitoring system is inadequate to meet the requirements of 40 CFR 265 Subpart F. Presently, the RCRA system consists of six wells, two designated as upgradient and four as downgradient. The existing well system does not meet the performance standard of immediate detection of releases. Additional permanent wells are needed and must include wells in all three water bearing zones located under the site.

Additional wells are needed along the west side of the hazardous waste unit. Presently, LRL has not placed wells directly at the downgradient limit of the western portion of the hazardous waste unit because this area has been approved for future filling.

The Wisconsin Department of Natural Resources (WDNR), pending closure plan approval, will require LRL to define the western most limit of the hazardous waste unit.

b) §181.49(4)(h) (§265.92) Sampling and Analysis

A number of deficiencies were noted in LRL's Sampling and Analysis Plan. Many are problems that can be easily corrected. These include analyzing the samples within the required holding times, improving the sampling quality control practices by including reagent blanks, equipment blanks, and sufficient sample volume so the laboratory can perform spike analysis. Also, LRL needs to better document the actual sampling procedures being used.

The current laboratory that LRL uses needs to improve its overall quality assurance/quality control procedures. This includes more stringent acceptance limits for metal spike recoveries, better calibration curves for atomic absorption spectrophotometry, and nitrate analyses. The laboratory needs to finalize and document the method to be used to perform metals analyses by inductively coupled plasma spectroscopy. Improvements are also needed in the organic laboratory.

c) §181.49(5)(d) (§265.93) Preparation, Evaluation, and Response

At the time of the inspection, a March 1986, statistical analysis submitted by LRL indicated that four wells LRL describes as part of the WDNR solid waste monitoring system were in assessment monitoring under NR 181. The summary portion of this report indicated that no statistically significant increases were found in the RCRA system of wells. A subsequent review by the WDNR found that LRL was in error and that there were statistically significant increases in the RCRA wells. LRL, therefore, must prepare an assessment monitoring plan as required by NR 181.49(5)(h) (40 CFR 265) and resample the RCRA wells.

2. GROUND-WATER PROGRAM PROPOSED FOR RCRA PERMIT

LRL did not file a Part B permit application. Therefore, LRL must close the hazardous waste unit. At the time of the inspection, LRL had not submitted an acceptable closure plan. In addition, LRL must comply with the ground-water requirements found in 40 CFR Part 265.

### 3. TASK FORCE SAMPLING AND MONITORING DATA ANALYSIS

Seven wells indicated chromium and lead levels above the limits given in Table X, NR 181.49 (5) Wis. Adm. Code. (40 CFR Part 265, Appendix III). The Table X limits are 50 ug/l chromium and 50 ug/l lead. These included wells in both the State solid waste system and the RCRA system. Wells affected were 6U (Chromium - 98 ug/l), 14U (Chromium 195 ug/l, Lead - 108 ug/l), 14L (Chromium 102 ug/l, Lead - 66 ug/l), 40U (Chromium - 56 ug/l, 54 ug/l), 40L (Chromium - 107 ug/l, 116 ug/l), 29L (Lead - 51 ug/l), and 39U (Lead - 165 ug/l).

Two wells had high or low pH measurements. Well 10U's pH was 6.17 and Well 39U's pH was 10.45.

Organic analyses of the ground-water monitoring wells indicated that a release of hazardous constituents is probably occurring at LRL. Background wells did not detect any organic compounds. Results from 39U found a number of organic compounds ranging from 4.8 ug/l 2-Methyl Phenol to 70 ug/l Xylene. These organics include: volatile compounds, acetone, benzene, trans-1,2dichloroethene, ethyl benzene, tetrachlorethene, toluene, trichloroethene and xylene; the semi-volatile compounds, 2,4-dimethyl phenol, 2-methyl phenol, 4-methyl phenol; and the pesticides, 4-4'-DDD and dieldrin.

The leachate sample contained high concentration of metals, organics, and indicator parameters.

### 4. CONFORMANCE WITH SUPERFUND OFF-SITE POLICY

The LRL site does not have interim status, has not applied for a permit, and is in the process of closing. Therefore, this site can not accept waste generated at superfund clean-up sites.

## II. TECHNICAL REPORT

### A. INTRODUCTION

Operation at hazardous waste treatment, storage, and disposal (TSD) facilities are regulated by the Resource Conservation and Recovery Act (RCRA P.L. 95-589). 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 constituents are not being released to the environment.

The Administrator of the U.S. Environmental Protection Agency (U.S. EPA) 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 address the cause of noncompliance. In addition, the Task Force was to examine the suitability of the facility as a provider of treatment, storage, or disposal services for waste managed by the Agency's Superfund program. The Task Force is comprised of personnel from EPA Headquarters, Regional offices, and the States. Currently, 58 TSD facilities are scheduled for ground-water evaluations. One of these was Land Reclamation, LTD. (LRL), near Racine, Wisconsin.

### B. OBJECTIVES

The Task Force inspection of LRL was conducted from August 4 to August 8, 1986, with the objectives of the evaluation listed below:

- ° Determine compliance with requirements of Wisconsin Administrative Code Section NR 181.49(5) (40 CFR 265 Subpart F) - ground-water monitoring and the monitoring system's capability of providing the required monitoring data.



- ° Evaluate the facility's ground-water monitoring program as described in the RCRA Part B permit application for compliance with Wis. Adm. Code Chapter NR 181.51 and NR 181.55 (40 CFR Part 270.14)(c).
- ° Evaluate the facility's potential compliance with Wis. Adm. Code Section NR 181.49(6) (40 CFR Part 264 Subpart F).
- ° Verify the quality of the company's ground-water monitoring data and evaluate sampling and analytical procedures.
- ° Determine if any ground-water contamination currently exists from site operations.
- ° Provide information to assist the Agency in determining if the TSD facilities meet U.S. EPA ground-water monitoring requirements for waste management facilities receiving waste from actions conducted under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

#### C. INVESTIGATIVE METHODS

The Task Force investigation at LRL consisted of:

- ° Reviewing and evaluating records and documents from U.S. EPA, Region V, WDNR, and LRL.
- ° Conducting an on-site inspection from August 4 through August 8, 1986.
- ° Evaluating off-site laboratories contracted by LRL for analysis of past and present ground-water samples.

- ° The sampling and analyzing of ground-water from monitoring wells, a surface water discharge point, and a leachate sump.

To accomplish the objectives, a facility Evaluation Team was assembled, and comprised of a Technical (record) Review Team, a Laboratory Evaluation Team (to evaluate on-site laboratories and off-site contract laboratories), and a Sample Collection Team. Each Team had individual responsibilities to 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 requirements. The evaluation was divided into six areas as follows:

- ° site history and design
- ° site geology and hydrogeology
- ° ground-water monitoring system
- ° ground-water sampling and analysis
- ° ground-water data quality and interpretation
- ° waste characterization and operations

Records and documents from U.S. EPA, Region V, and the WDNR offices, were compiled by the Planning Research Corporation (PRC) of Chicago, Illinois, under contract with the U.S. EPA. These documents were reviewed prior to and during the on-site inspection. On-site facility records were reviewed to verify and augment information currently in government files. These records were reviewed to obtain information on facility operations, construction details of waste management units, and the ground-water monitoring program. The facility was requested to supply the U.S. EPA with a

copy of selected documents for an in-depth evaluation. Specific documents and records that were reviewed included the facility ground-water sampling and analysis plan; outline of the facility ground-water quality assessment program; analytical results from past ground-water sampling; monitoring well construction data and boring logs; site geologic report; site operations plan; facility permits; waste management unit design and operation reports; and operating records specifying the general types of waste, the quantities of waste, and location where the waste was disposed of at the facility.

## 2. LABORATORY EVALUATION TEAM

The off-site laboratory that analyzed LRL's sample was evaluated regarding its responsibilities under the LRL ground-water sampling and analysis plan. Analytical equipment and methods, and quality assurance procedures and records were examined for adequacy. Laboratory records were inspected for completeness, accuracy, and compliance with State and Federal requirements. The ability of the laboratory to produce quality data for the required analyses was also evaluated. Later in this report, a detailed discussion of this evaluation is presented under "Sample Analysis and Data Quality Evaluation".

## 3. SAMPLE REVIEW TEAM AND SAMPLE COLLECTION

### a) Methods

Samples for the Task Force evaluation were collected by Versar, Inc. (hereafter referred to as Versar), a U.S. EPA contractor, under the supervision of U.S. EPA personnel. Teflon®\* (perfluoroethylene) bailers, provided by

\* Teflon® is a registered trademark and will appear hereafter without the ®

Versar were used to sample for volatile organic analyses (VOA), purgeable organic carbon (POC), purgeable organic halogens (POX), extractable organics, metals, phenols, cyanide, sulfate/chloride, nitrate and ammonia. Clean sample bottles and preservatives were provided to Versar by a U.S. EPA contract laboratory for both the Task Force and facility split samples. Versar also supplied all the equipment and materials necessary to manage, handle, field filter, document, and ship the Task Force sample.

Prior to obtaining water levels, purging, or sampling, Versar monitored the open well head for organic chemical vapors using a photoionization detector to ensure the well head was safe. After safety screening, static water levels were measured in 58 wells for use in the hydrogeological evaluation of the site. All water level indicator units were calibrated to ensure comparable measurements.

Monitoring well sampling activities were proceeded by purging of the static water column, using the Teflon bailers. Where possible, a volume of water equal to three times the water volume present in the well was evacuated before sampling. When these volumes could not be obtained, the wells were purged to dryness. Slow recharging wells were sampled when there was a sufficient volume of water to fill at least one parameter bottle set, including split samples for LRL. On some occasions, this required purging on one day and sampling on the next day. To obtain a sufficient volume of water for all parameters, it was necessary to return to some wells on a number of occasions.

Methods of sample collection depended on the nature of the sample site. All well sites were sampled using a dedicated Teflon bailer supplied by Versar. In most cases, well recharge rates were sufficient to allow sampling immediately after purging. At some wells, it was necessary to

wait 2 hours to 24 hours for the well to recharge sufficiently to obtain the desired sample volume. The bailer and cable used at such wells were left on site, sealed and kept under custody. Some wells required two or three visits to obtain the required sample volume. Purging and sampling data are summarized in Table A-4 and A-5 in Appendix A.

All sample bottles were filled directly from the bailer using a bottom-emptying device. Volatile organic analyses (VOA) vials were filled as replicate samples while other sample bottles were filled proportionally between U.S. EPA and facility containers. Sample bottle types, preferred order of filling, sizes and preservatives are listed in Table 1.

The surface sample was collected at the location where LRL is required to sample their surface discharge, under their Wisconsin Pollution Discharge Elimination System (WPDES) permit. Versar personnel collected this sample by wading into the stream and directly filling the sample container by immersing them in the water. A split was collected for LRL for VOA, POC, POX, and extractable organics.

A sample was taken, using a Teflon bailer, from one of the LRL leachate sumps. The Versar sampling team, wearing level B safety protection (i.e., SCBA and protective clothing), filled the sample containers, in the order given in Table 1. For safety reasons, these samples were not chemically preserved, but were kept iced during sample handling and shipment. A split was given to LRL for VOA, POC, POX, and extractable organics.

T A B L E 1  
PREFERRED ORDER OF SAMPLE COLLECTION  
BOTTLE-TYPE, AND PRESERVATIVE LIST

<u>Sampling Order</u>	<u>Parameter</u>	<u>Bottle-Type</u>	<u>Preservatives</u>
1.	Field Measurements *	1 -200 mL Plastic	None
2.	Volatile organics	4 - 40 mL VOA vials	Cool 4°C No Headspace
3.	Purgeable Organic Carbon (POC)	1 - 40 mL VOA vial	Cool 4°C No Headspace
4.	Purgeable Organics Halogens (POX)	1 - 40 mL VOA vial	Cool 4°C No Headspace
5.	Extractable organics	4 - 1L amber glass	Cool 4°C
6.	Total metals	1 - 1L plastic	HNO <sub>3</sub> to PH<2 Cool 4°C
7.	Dissolved metals **	1 - 1L plastic	HNO <sub>3</sub> to PH<2
8.	Total Organic Carbon (TOC)	1 - 50 mL glass	H <sub>2</sub> SO <sub>4</sub> to PH<2 Cool 4°C
9.	Total Organic Halogens (TOX)	1 - 1L amber glass	Cool 4°C No Headspace
10.	Phenols	1 - 1L amber glass	H <sub>2</sub> SO <sub>4</sub> to PH<2 Cool 4°C
11.	Cyanide	1 - 1L plastic	NaOH to PH>10 Cool 4°C
12.	Sulfate and chloride	1 - 1L plastic	Cool 4°C
13.	Nitrate and ammonia	1 - 1L plastic	H <sub>2</sub> SO <sub>4</sub> to PH<2 Cool 4°C

\* Field measurements included pH, specific conductance, temperature and turbidity.

\*\* Samples were filtered before preservation with HNO<sub>3</sub>.

(b) Sample Location

Samples were taken from the 17 monitoring wells listed below, as well as WPDES sample point 001 and a leachate sump. Wells being used by LRL to report on RCRA compliance are noted with a R.

MONITORING WELLS SAMPLED

6U(R)	22U	40U
6L	22L	40L
9U	29U	108L(R)
10U(R)	29L	109U
14U	30L(R)	110U
14L	39U	

c) Quality Assurance and Control

Quality assurance and quality control (QA/QC) for EPA contractor sample collection, handling and analysis was conducted in accordance with the Hazardous Waste Ground-Water Task Force - Protocol for Ground-Water Evaluation (EPA, 1986a) prepared by the Task Force. The Sampling Team reviewed Versar's procedures during the sample effort to ensure consistency with the QA/QC and evidence handling requirements.

Versar also prepared and submitted to the contract laboratories, three types of blanks during the inspection period. Field blanks, for all parameters, were prepared on August 5, (near Well 29L), August 7 (near Well 40U), and August 8, 1986 (near Well 40U), by pouring high performance liquid chromatography (HPLC) water into the appropriate sample containers after the wells were sampled. One set of sample containers was filled with HPLC water at Versar's laboratory, brought to the site and submitted for analyses for each parameter as a trip blank. The trip blank was shipped to the laboratory, with samples collected on August 7, 1986. On August 5, a Teflon bailer was rinsed with HPLC water and the water collected in the appropriate containers for submittal to the laboratory as an equipment blank. This rinsing procedure was conducted near Versar's supply truck, which was parked near the landfill office building.

Field measurements performed on site included temperature, pH, specific conductance, and turbidity. All thermometers were calibrated against a thermometer traceable to the National Bureau of Standards (NBS) standardized instruments. Daily calibrations were performed on each of the pH and conductance meters to be used on that day. Calibration checks were performed prior to each measurement of pH and conductivity. The turbidity samples from each well were saved and all the days' samples were analyzed as a batch. The turbidity meter was standardized daily, immediately prior to performing these tests.



An added quality control measure was the inclusion of duplicate sets. At Wells 40U and 40L, two complete sets (10% of all wells sampled) of samples were collected. These duplicate samples were a quality control measure of the sampling method. This is different than the equipment blank which is used to assure that sampling was cleaned properly.

All sample-contacting equipment which was to be used on site was thoroughly cleaned, wrapped and sealed in plastic for transport at Versar's laboratory. Sampling equipment (bailers) to be used at the same site, was stored in the truck, in plastic bags, and under custody seal. No sampling equipment was used at more than one site. Used or contaminated bailer cable (Teflon coated stainless) or water level indicator tapes were cleaned by wiping with a hexane soaked tissue, followed by wiping with a tissue soaked with distilled water.

d) Custody and Sample Handling

All samples collected for the U.S. EPA were shipped to the contractor laboratories: Compu-Chem (organics) in Research Triangle Park, NC, and Centec (inorganics) in Salem, VA, in accordance with applicable Department of Transportation (DOT) regulations (49 CFR Parts 171-177). Suspected contaminated samples were flagged as "medium-level hazardous" for laboratory personnel. All ground-water and surface water samples were considered "environmental" samples. Each sample shipment was accompanied by a Chain-of-Custody Record completed by Versar personnel. This form (Figure 2) identified the contents of the shipment in terms of sample type, date, and time, etc. The original custody form accompanied the shipment. Samples taken from the LRL site by U.S. EPA personnel were documented with a Receipt for Samples forms completed by Versar Personnel. The originals were retained by the EPA Field Team Leader.

**FIGURE 2**

**Versar** INC.

### CHAIN OF CUSTODY RECORD

[illegible]

Chain-of-Custody was lost on four sample sets shipped to the contract laboratories on August 7, 1986. Samples affected were from Well 22L, 109U, a field blank, and one of two samples collected from Well 40L. During packing of those samples, the Chain-of-Custody forms were sealed into the wrong shipping containers. Other samples shipped on the same date for Wells 40U, 110U, and duplicate sample from Well 40L and the trip blank were packed properly and not affected. After a discussion among the team members, the following was done to correct the problem.

1. The lab was instructed to discard the sample that lost custody from Well 109U. Since the duplicate sample for Well 109U retained custody, the data is valid and summarized in Appendix B.
2. The lab was instructed to discard the sample for Well 40L. On August 8, this well was repurged and resampled. A duplicate sample was also collected to meet the Task Force QA/QC limits which require that 10% of all samples be taken in duplicate.
3. The lab was instructed to discard the field blank collected on August 7, near Well 109U. A replacement field blank was then collected on August 8, near Well 40L.
4. Well 22L was not resampled and the data reported in Appendix B, is for comparison purposes only.

e) Scheduling

Many logistical problems, such as weather, equipment, and well performance affected the time required to obtain the samples, and influenced the sequence of sampling. The Sampling Team Leader, in conjunction with the Field Team Leader, prioritized the sampling points and developed daily schedules to minimize delays. Some wells, due to slow recharge, required more than one visit to obtain a complete set of samples.

Static water levels were taken from 58 monitoring wells and piezometers on August 4 and 5, 1986, for use in the geological evaluation. Purging and sampling activities were begun on August 4 and completed on August 8, 1986.

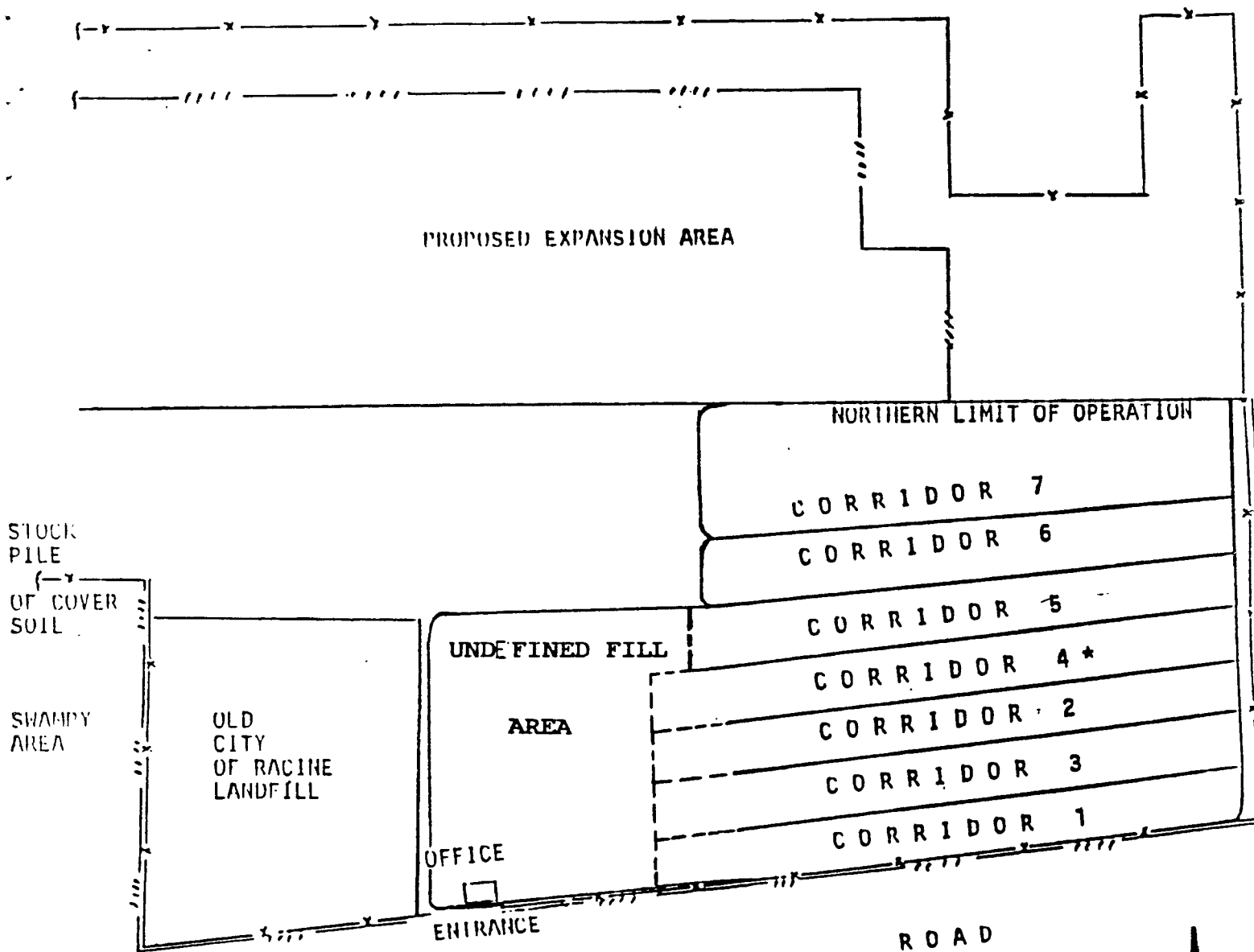
## D. WASTE MANAGEMENT UNITS AND OPERATIONS

### 1. INTRODUCTION

Land Reclamation, LTD. (LRL) is located in the south 1/2, of the Northeast 1/4, Section 32, Township 4 North, Range 22 East, Town of Mount Pleasant, Racine County, Wisconsin. A portion, in the southwest corner, was leased to the city of Racine and utilized as a landfill for residential, incinerator ash and foundry sand wastes in 1963. In August 1970, LRL assumed operation of this landfill and expanded disposal operation to the east side of the site. LRL also owns 140 acres directly to the north of the 80 acre parcel evaluated by the Task Force. The facility has applied to the WDNR for expansion of the solid waste operation into this area.

Records indicate that solid and hazardous waste has been disposed of in Corridors 1-6 on the east side of the site, see Figure 3. This area has been defined by LRL as the Hazardous Waste Unit. Municipal and Foundry waste was placed in the old city of Racine landfill on the west side of the site. In the area between these two landfills solid waste was placed but the exact area is not well defined.

In 1980, LRL began the process to operate under the requirements of the RCRA program. On August 19, 1980, the facility submitted a notification of hazardous waste activity for its landfill operation with the U.S. EPA. Then, on November 19, 1980, LRL filed a Part A application and thus obtained interim status. The Wisconsin DNR, on December 10, 1982, denied an interim status license to LRL because sufficient information had not been provided.

FIGURE 3MAP SHOWING SITE OPERATIONSKEY

- Proposed limit of waste
- Property line
- x —— Northern limit of operations (During inspection)

\* Shows where base of Corridor 4 is located. To complete Corridor 4 to a grade of 790 feet, fill was placed over Corridors 1, 2, and 3.

Note: Map not to scale.



The denial, issued by the WDNR in December 1982, required LRL to close Corridors 1 through 4 by June 1983. LRL had not filed a Part B application nor a certification of compliance with ground-water monitoring and financial responsibility requirements by November 8, 1985. Therefore, LRL can no longer accept hazardous waste. The closure plan for the facility submitted by LRL on November 23, 1985, did not specifically address the closure of the hazardous waste portion of the landfill.

## 2. WASTE MANAGEMENT UNITS

### a) RCRA Units

Construction of the first phase of the southeast portion of the site began in 1970, with the excavation of Corridor 1. This corridor is approximately 200 feet wide and 800 feet to 1000 feet long. An accurate bottom elevation was not determined during construction, and its depth can be estimated to be 25 feet below grade based on boring information taken during the installation of the leachate head wells.

Construction of Corridor 2 began in early 1971. This trench is approximately 200 feet wide and 800 feet to 1000 feet long. As in Corridor 1, bottom elevation was not determined. The corridor is estimated to be 30 feet to 35 feet deep.

The size of Corridor 3 is not well documented. This corridor was constructed in 1975, between Corridors 1 and 2 by excavating until the side walls of Corridors 1 and 2 collapsed.

Corridors 1, 2, and 3 were constructed before the enactment of regulations requiring recompacted clay liners and leachate collection systems. These corridors were therefore excavated into native clays and are unlined. And as noted above, these units have not been closed.

Construction of Corridor 4 was begun in 1978. This corridor is approximately 200 feet wide and 800 feet to 1000 feet long. Corridor 4 was excavated to a greater depth than Corridors 1 - 3, but due to lack of documentation, the ultimate depth is unknown. A partial leachate collection system was installed below grade in Corridor 4 only. During construction, this corridor was completed to a surface elevation of 790 feet above mean sea level or approximately 80 feet above the surrounding area. To achieve this elevation, which is 40 feet higher than the first three corridors, Corridor 4 extended laterally across the surface of the first three corridors. As in the other three trenches, Corridor 4 was constructed in natural clay and is unlined.

Corridor 5 was the first truly "engineered" trench on the site. This construction was completed in 1980, and documentation of its design was submitted to the WDNR in February 1981. This corridor was constructed over a five foot thick recompacted clay base with a leachate collection system. The corridor is approximately 200 feet wide, 800 feet long and 35 to 40 feet deep.

Corridor 6 was also a designed system engineered and constructed over a five foot thick recompacted clay liner, and covers an area of approximately 4.6 acres. Construction on this trench began in 1985, and was still active at the time of the inspection. During the construction of this corridor, a leachate collection systems were installed. This Corridor is connected hydraulically to Corridor 1-5 and is an extension of the hazardous waste unit.

#### b) Pre-Interim Status Solid Waste Management

In 1963, the city of Racine began operating a landfill in the southwest corner of the site. The city disposed primarily of municipal and foundry wastes. This landfill is approximately 600 feet to 700 feet wide and 800



feet to 900 feet long. The municipal and foundry wastes were generally deposited on the existing ground surface with little excavation. The base grades of the unit were not documented although the elevation of the nearby wetland ranges from 660 feet to 670 feet above mean sea level. The unit was completed in 1970, to an elevation of 740 feet above mean sea level (MSL) or approximately 60 feet above the surrounding area. The unit does not contain a leachate collection system and was constructed over natural soils.

Solid waste was also disposed of in the area between the old city of Racine Landfill and Corridors 1 - 4. No documentation giving the units size, or base grade exists, nor was a leachate collection system installed. A number of borings have shown that the majority of waste buried in this area was from the foundry industry.

#### c) Waste Characterization

##### ° Introduction

Hazardous waste was disposed of at the LRL site from the early 1970s until December 1982. During the period that LRL operated under RCRA Interim Status, November 1980 to December 1982, hazardous waste was placed in the landfill. Table 2 shows the types of waste disposed of during Interim Status.

##### ° Discussion

- At the time LRL operated under RCRA Interim Status limited waste characterization was performed on incoming wastes (LRL's Waste Analysis Plan required that 10% of liquid wastes received at the facility undergo finger print analysis).

Analytical records of these incoming waste characterizations could not be produced by LRL.

T A B L E 2

HAZARDOUS WASTE ACCEPTED BY LRL \*

<u>EPA I.D. NUMBER</u>	<u>DESCRIPTION</u>
D001	Characteristic of ignitability.
D003	Characteristic of reactivity.
D007	Characteristic of EP Toxicity, Chromium.
D008	Characteristic of EP Toxicity, Lead.
F001	Spent halogenated solvents and sludges from degreasing operations and still bottoms.
F002	Spent halogenated solvents and still bottoms.
F005	Spent non-halogenated solvents and still bottoms.
F006	Wastewater treatment sludges from electroplating operations.
F007	Spent cyanide plating bath solutions from electroplating operations.
F008	Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used.
F009	Spent stripping and cleaning solutions from electroplating operations where cyanides are used in the process.
K001	Bottom sediment sludge from the treatment of wastewater from wood preserving processes using creosote and/or pentachlorophenol.

\* Table compiled from manifest, scale house records, and waste characterization records supplied by LRL.

TABLE 2 (Cont'd)

<u>EPA I.D. NUMBER</u>	<u>DESCRIPTION</u>
P030	Discarded commercial chemical products, off-specification species, container residues and spill residues. P030 listing is for cyanide (soluble cyanide salts), not elsewhere listed.
U080	Discarded commercial chemical products, off-specification species, container residues and spill residues containing dichloromethane, (methylene chloride).
U151	Discarded commercial chemical products, off-specification species, container residues and spill residues containing mercury.
U188	Discarded commercial chemical products, off-specification species, container residues and spill residues containing phenol.
U210	Discarded commercial chemical products, off-specification species, container residues and spill residues containing tetrachloroethylene.
U227	Discarded commercial chemical products, off-specification species, container residues and spill residues containing 1,1,2-trichloroethane.

- LRL record keeping during interim status was not adequate to provide information on quantities and location of the hazardous waste accepted at the facility. Task Force comparisons of manifest, scale house records and waste characterization records showed some discrepancies in both quantities and discrepancies on waste accepted at the facility.
- LRL claims of total waste accepted can not be substantiated by their records.

d) Site Operation

° Waste Disposal

Hazardous waste was disposed of in Corridors 3, 4, and 5. These corridors overlay Corridors 1 and 2, and are connected hydraulically to Corridor 6. Hazardous waste may have been disposed of in Corridors 1 and 2 also. Therefore, all 6 corridors are considered to be one RCRA hazardous waste unit.

Hazardous waste was disposed along with municipal solid waste. Some hazardous wastes were disposed of by digging a trench in the refuse and placing the hazardous waste in the trench. The trench was periodically covered with refuse or clay. Other hazardous wastes were mixed with municipal solid waste in the active area and then covered with nonhazardous solid waste or clay. Neither the trench disposed waste nor the co-disposed waste were always covered on a daily basis as required by the WDNR.

° Leachate Handling/Gas Collection

Recent corridors (5 and 6) of the LRL landfill are designed for operation as a zone-of-saturation landfill. Corridors 1 - 4 were not originally designed to meet the zone-of-saturation conditions. LRL is required to monitor and pump leachate that collects in the landfill, to produce an inward flow gradient for the ground-water.

Leachate collection and removal systems were installed at the base of Corridors 5 and 6 before waste was placed in those corridors. Corridor 4 also contains a partial leachate collection and removal system which was added after filling had begun. The location, with respect to the base of Corridor 4, is not well documented. A leachate dewatering trench has been installed on the west side of Corridors 1 - 4, and the west, north, and east perimeters of the city of Racine solid waste unit. Certification documents as to the construction of these trenches had not been submitted by LRL at the time of the inspection. In addition to the leachate collection and removal systems, LRL has installed a number of wells to monitor leachate levels. Several of these leachate monitoring wells located in Corridors 1, 2, and 3 also contain pumping equipment for the removal of leachate. The leachate removed from both collection systems and the leachate monitoring wells is pumped to the city of Racine wastewater treatment plant. Current information indicates leachate heads as high as 750 feet above mean sea level, about 50 feet above adjacent undisturbed grade. This indicates a likely outward gradient at the time of the inspection. LRL has not provided the WDNR with records on leachate pumping. At time of the inspection, LRL was installing a gas extraction system without approval from the WDNR or U.S. EPA. This system is designed to extract and collect gases generated from the landfill. This gas will be sold to a local industry for energy.

The LRL site has been licensed by the WDNR for the disposal of municipal solid waste and to be operated as a zone of saturation site, requiring an inward gradient induced by leachate collection. The contours on Figures 3, 4 and 5 in the Site Geology and Hydrogeology Section show little evidence of any inward gradient. It is important for LRL to maintain an inward gradient since wells along the south edge of the site show that the disposed landfill waste intersects both the water table and the upper sand seam. Gas bubbling up in puddles after a rain event, was noted by the sampling crew during the inspection along the south side of the site. In addition, gas bubbles were noted in Well 30T when water level measurements were taken on August 4, 1986, by the Task Force.

To assure that the facility is operated as a zone of saturation site, LRL needs to pump leachate to reduce head levels and, at least annually, an evaluation of ground-water flow must be conducted. The facility, in the past, has failed to submit to the WDNR the required annual ground-water evaluation.

° Surface Water Control and Discharge

Surface water is discharged from two locations at LRL, a pond discharge, and the drainage way discharge. These discharges are regulated under a Wisconsin Pollution Discharge Elimination System (WPDES) Permit Number WI-0045420-1. LRL is required to monitor these points once per week for total suspended solids (TSS), five day biochemical oxygen demand (BOD<sub>5</sub>), pH, and chemical oxygen demand (COD). Once per quarter LRL must also monitor these discharges for arsenic, copper, cadmium, lead, nickel, zinc, specific conductivity, chloride, temperature, ammonia-nitrogen, nitrate-nitrogen, and total Kjeldahl-nitrogen (TKN). LRL has exceeded the limits of their WPDES permit a number of times.

Leachate seeps occurring along the site perimeter (particularly the south slope) have historically been released off-site with no collection or treatment. At the time of the inspection, LRL was initiating construction of a sedimentation basin in the southwest corner of the site to contain site run-off.

° Discussion

During the inspection, the Task Force noted a number of problems associated with the site operation. These concerns are listed below:

- ° Ground-water contours (see next section) and data submitted by LRL indicates that LRL is not operating this facility as an inward gradient, zone-of-saturation site as required by the WDNR. Leachate heads have not been maintained at a level to induce ground-water into the landfill. Information indicates that leachate head levels are over 50 feet above the water table adjacent to the facility which would produce an outward gradient.
- ° The closure plan submitted does not address the erosion problems on the south and east slopes, the construction of a cut-off wall through Unit 2, the upper sand seam, the problem with methane seeps along the south slope, future surface maintenance, ground-water monitoring, the physical hydraulic barrier, and the RCRA cap.
- ° LRL began removing material adjacent to the south slope without authorization from the WDNR.

E. SITE GEOLOGY AND HYDROGEOLOGY

1. INTRODUCTION

The LRL landfill is located in a glaciated area of gently undulating topography formed by low, irregular end moraines with slight modification due to post-glacial erosion. The regional land surface gradient, which is controlled by an uneven bedrock surface, slopes to the east at 10 feet per mile. The land surface elevations range from 680 feet above MSL at the Pike River (1/2 mile west of the site) to 480 feet above MSL at Lake Michigan. Modifications to the local topography, near the site, have occurred due to sand and gravel operations and the landfill operations which have created a local topographic high.

Regional surface water drainage is toward Lake Michigan. Locally, surface water is drained from the site to a wetland adjacent to the west side of the landfill. This wetland drains to the Pike River, which drains into Lake Michigan.

## 2. HYDROGEOLOGIC UNITS

The upper most formation of the active portion of the site (eastern side) is the Oak Creek Formation of Quaternary age. It was deposited on the west facing slope of the Inner Lake Border moraine, and consists of fluvial and lacustrine sediments deposited proglacially during retreats of the ice margin. The far western portion of the site is underlain by a proglacial outwash or lacustrine plain.

The Oak Creek Formation is 110 to 150 feet thick and dips slightly to the west. LRL's geologists have identified seven units in the Oak Creek Formation, and LRL has installed monitoring wells in three of these units. The sands of the Oak Creek Formation form local, low-yielding aquifers. The units and well series are identified as follows in order of increasing depth:

- 1) The surface unit, designated Unit 1, is a clay till that slowly pinches out as it dips to the west. The unit varies in thickness from 4 feet to 42 feet. LRL has installed wells in this unit and they are identified as water table (T series) wells.
- 2) Unit 2 consists of fluvial and lacustrine sands and silts, and ranges in thickness from 6 feet to 27 feet. LRL has installed monitoring wells in this unit and has identified them as the U (upper most aquifer) wells.



- 3) Unit 3 is composed of till and lacustrine clay.
- 4) Unit 4 is similar to Unit 2 above and consists of sand and silt. LRL has installed monitoring wells in this unit which are identified as the L series (lower aquifer) wells. This unit thins out to the east.
- 5) Unit 5 is present only under the eastern portion of the site and consists of silt and clay. The unit ranges in thickness from 0 feet to 17.5 feet.
- 6) Unit 6 is composed of sands and silts. Although found under the entire site, this unit at times is difficult to delineate from the lower underlying clay, sand, and silt.
- 7) The lowest unit, Unit 7, is a gray clay with silt and sand seams.

Underlying the Oak Creek Formation is the Niagaran Aquifer. The Niagaran is a fossil-reef dolomite which forms the principal shallow aquifer in the area. This dolomite ranges from 110 feet to 150 feet below the ground surface. The underlying Maquoketa Shale separates the Niagaran dolomite from a series of Cambrian and Ordovician sandstones and dolomites which are pumped extensively for municipal water supplies. All bedrock formations dip eastward at about 15 feet per mile.

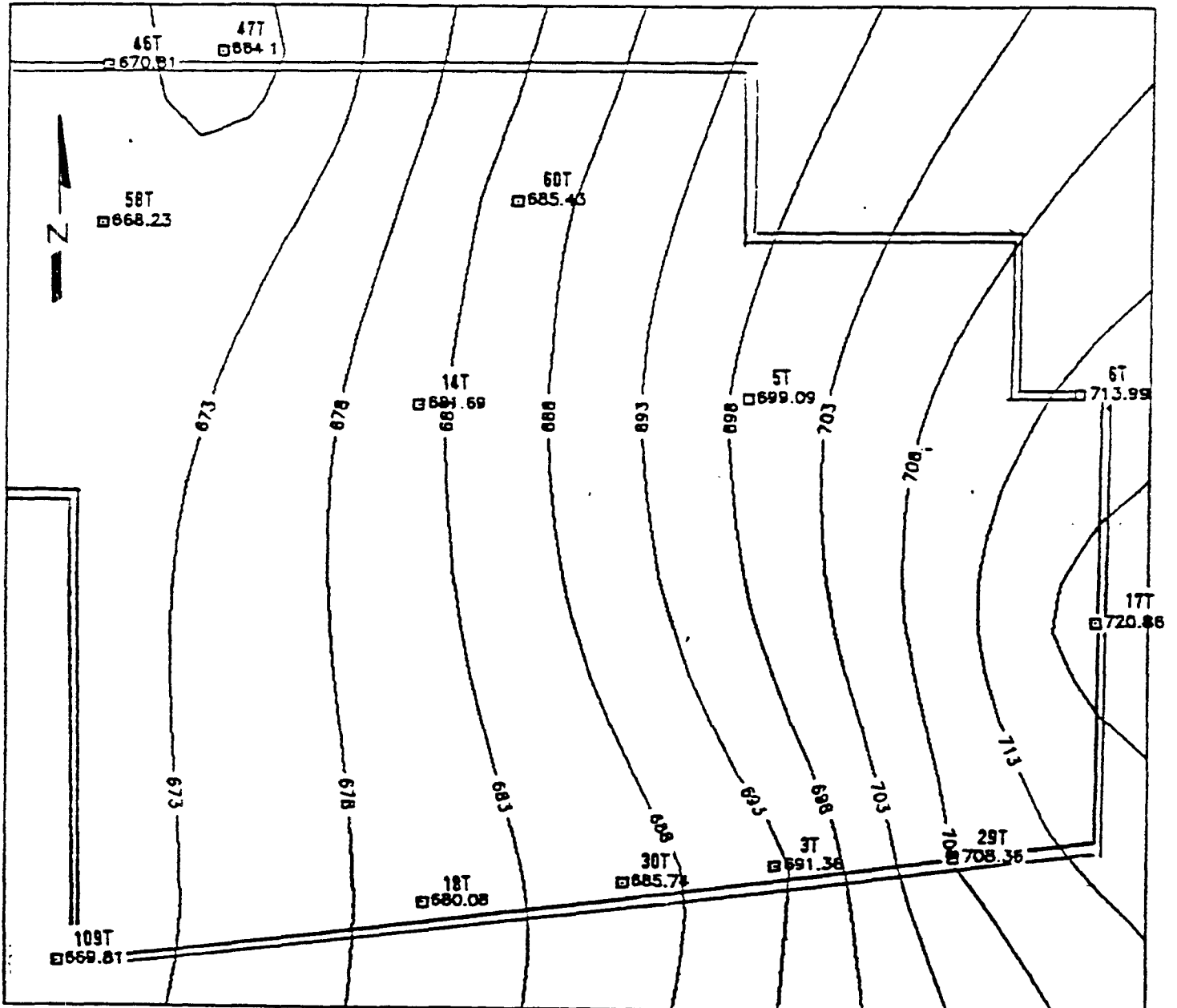
### 3. HYDRAULIC CONDUCTIVITIES AND GROUND-WATER FLOW

Ground-water flow in the Oak Creek Formation varies from westerly to southerly. Ground-water levels in the T series of wells indicate flow is westward (see Figure 3) towards the Pike River, located 500 to 1200 feet west of the site. The U series of wells indicate ground-water flow is primarily to the west with a component of flow to the north (see Figure 4). The L series of wells indicates flow is to the south from a ground-water mound located in the northeast corner of the site (see Figure 5). Water level measurements taken by the Task Force on August 4 and 5, 1986, were used to construct Figures 4, 5, and 6. Some variation in ground-water flow direction may be attributed to excavation, filling, and leachate collection. Horizontal gradients calculated from the data used in Figures 4, 5, and 6 are 0.019 feet per foot for the Unit 1 water table or T wells, 0.023 feet per foot for Unit 2 or U wells and 0.012 feet per foot for Unit 4 or L wells.

The data used to construct Figures 4, 5, and 6, indicates definite downward gradients. The saturated thickness of Unit 3 layer over the upper sand seam is about 20 feet. Head differences between the T and U-series wells indicate the vertical gradient is about 0.4 ft./ft. The thickness of the layer between the upper and lower sand seams is about 10 feet. Head difference between the upper and lower sand seams indicates the vertical gradient is about 1.7 ft./ft.

FIGURE 4

POTENTIOMETRIC CONTOUR IN THE WATER TABLE



T Series Wells 8/86

KEY

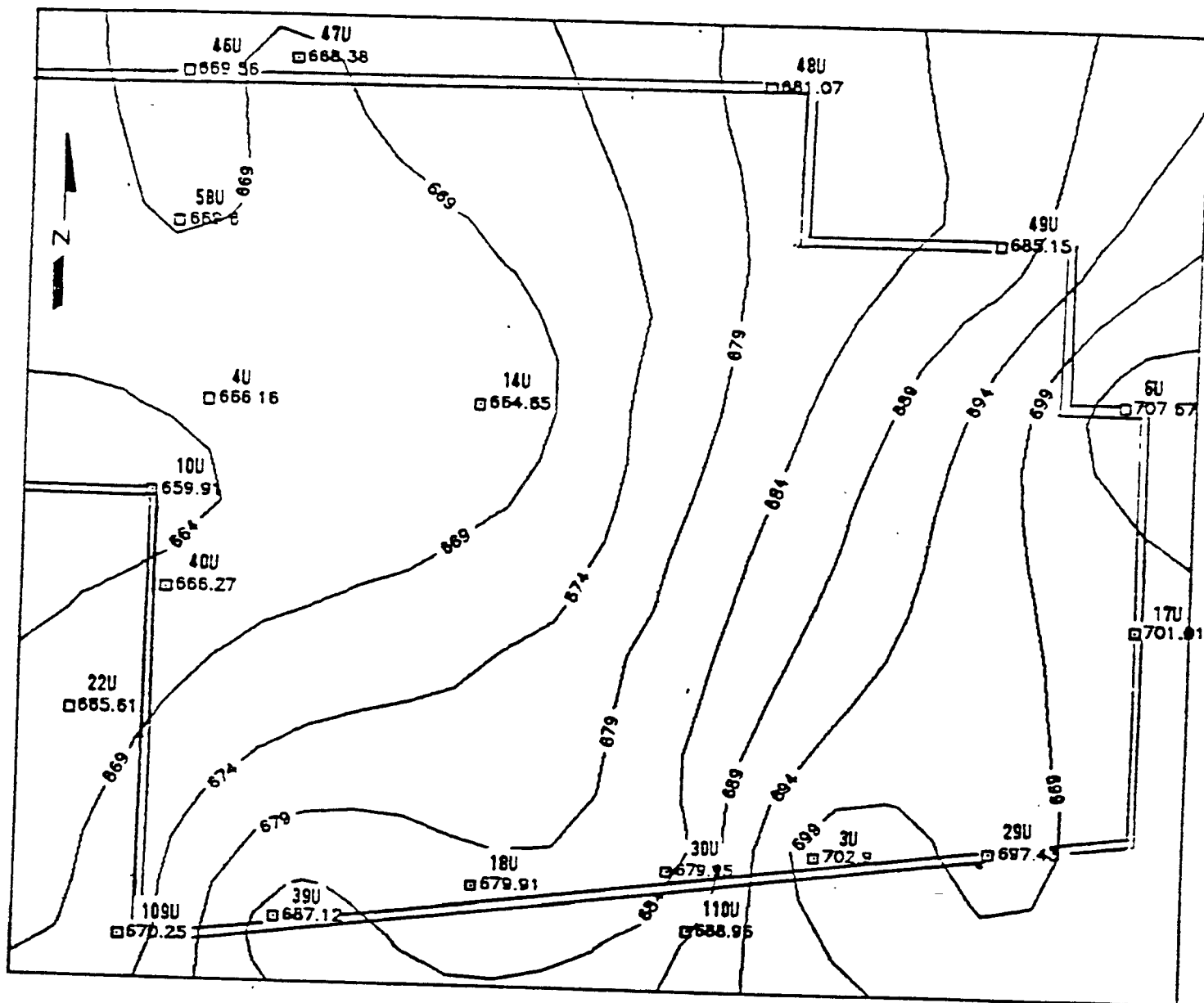


- WELL LOCATION

14U - WELL NAME

664 - GROUND-WATER ELEVATION (FT. ABOVE MSL)

**FIGURE 5**  
**POTENTIOMETRIC CONTOUR OF THE UPPER SAND**



U Series Wells 8/86

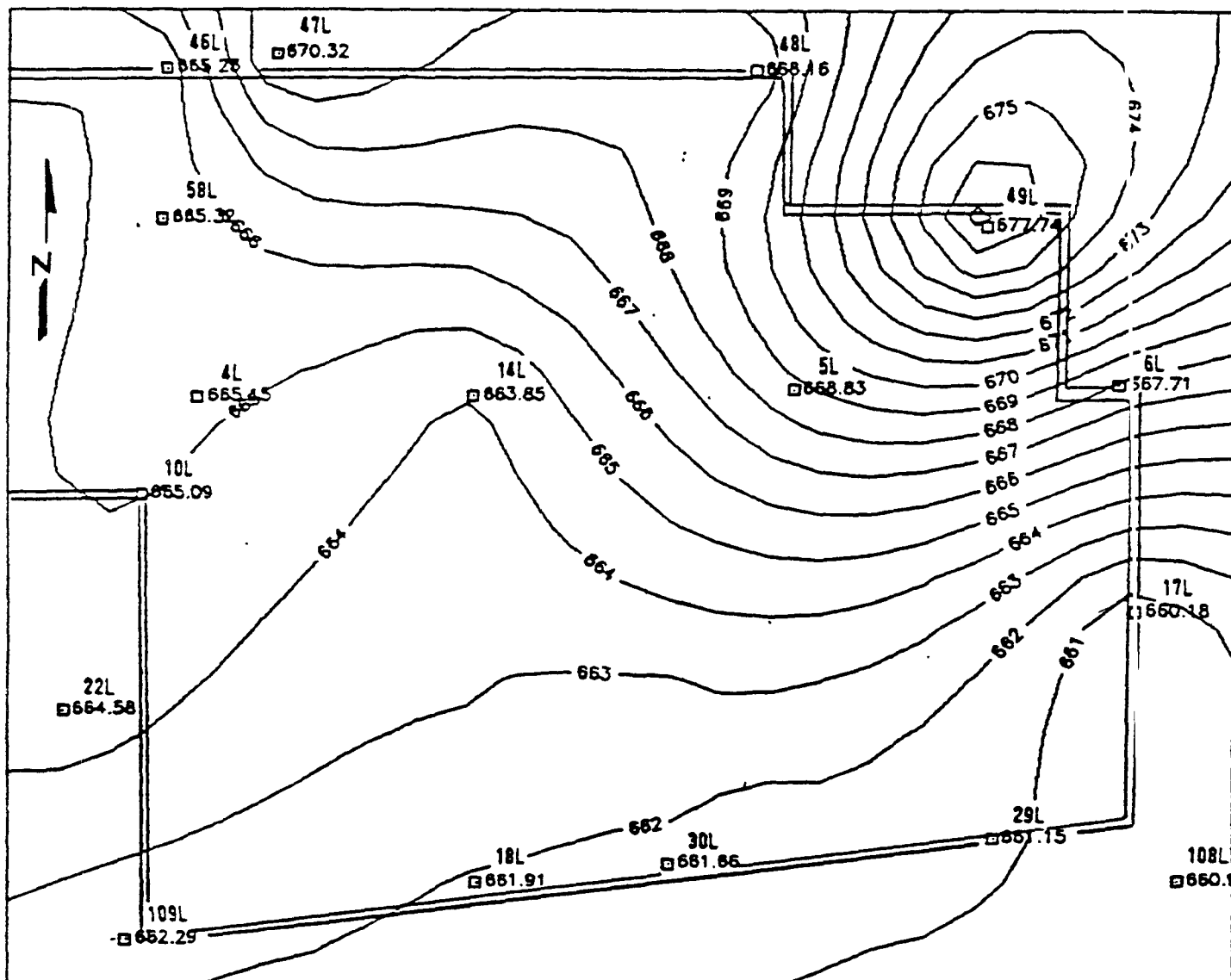
KEY

- WELL LOCATION

14U - WELL NAME

669 - GROUND-WATER ELEVATION (FT. ABOVE MSL)

FIGURE 6  
POTENTIOMETRIC CONTOUR IN THE LOWER SAND



L Series Wells 8/86

KEY

 - WELL LOCATION

18L - WELL NAME

663 - GROUND WATER ELEVATION (FT. ABOVE MSL)

The laboratory permeabilities of the Oak Creek Formation soil units range from  $10^{-4}$  cm/sec to  $10^{-8}$  cm/sec. This information, compiled by LRL's geologists, is summarized in Table 3.

Ground-water flow in the Silurian age domomites is primarily to the east.

T A B L E 3

LABORATORY PERMEABILITY OF THE OAK CREEK

SOIL UNITS BENEATH LRL LANDFILL \*

UNIT NO.	BORING NO.	PERMEABILITY (cm/sec)	UNIT NO.	BORING NO.	PERMEABILITY (cm/sec)
1	5-48	$5 \times 10^{-8}$	2	92S	$1.5 \times 10^{-5}$
1	14-3A	$2 \times 10^{-8}$	2	95D	$3.0 \times 10^{-5}$
2	5B	$1 \times 10^{-6}$	2	105	$3.2 \times 10^{-5}$
2	75B	$1.8 \times 10^{-6}$	2	98	$1.5 \times 10^{-5}$
2	76-9	$5.8 \times 10^{-6}$	2	101	$1.1 \times 10^{-4}$
2	80-8	$3.6 \times 10^{-4}$	2	103	$1.1 \times 10^{-5}$
2	81D	$2.0 \times 10^{-4}$	3	10-5	$3 \times 10^{-8}$
2	82-9	$2.2 \times 10^{-4}$	3	17-12	$5 \times 10^{-8}$
2	84	$7.1 \times 10^{-6}$	4	14-6B	$2 \times 10^{-5}$
2	87S	$3.7 \times 10^{-5}$	6	14C	$1 \times 10^{-5}$
2	87D	$2.1 \times 10^{-5}$	7	5C	$6 \times 10^{-5}$
2	90	$6.1 \times 10^{-5}$			

\* Source : Foth & Van Dyke and Associates, Inc., (1987), Closure and Long Term Care Plan for Land Reclamation, Ltd. Landfill.

F. GROUND-WATER MONITORING PROGRAM DURING INTERIM STATUS

1. REGULATORY REQUIREMENTS

LRL is required to monitor ground-water under the Section NR 181.49 (Ground-Water and leachate monitoring), Wis. Adm. Code, (40 CFR Part 265, Subpart F) for interim status facilities. In addition, LRL must also monitor ground-water to meet requirements of Section NR 181.44(12) (Closure of Facilities Without Operating Licenses), 40 CFR Part 265, Subpart G, and Wisconsin DNR's regulations for the operation of solid waste landfills in Chapter NR 140 and NR 180, Wis. Adm. Code.

2. GROUND-WATER MONITORING SYSTEM

a) Monitoring Well History

During September and October 1975, LRL installed 18 ground-water monitoring wells. These wells and eight additional soil borings were taken as part of a feasibility study for the future operation of the site. Presently, only two of the wells (6T and 8T) remain in use as part of LRL's state solid waste monitoring system. Installation dates and other well construction data are summarized in Table 4.

In 1976, six additional ground-water monitoring wells were installed, two in March and four in August. Of these six wells, only three (10U, 11U, and 9U) remained in use at the time of the inspection. All three wells are screened in the upper sand seam that LRL has designated with a "U" for upper most aquifer. Well 10U is part of LRL's RCRA monitoring system and is considered by LRL as being downgradient. The remaining two wells are part of the state solid waste network.



TABLE 4

## CONSTRUCTION DATA FOR LRL's MONITORING WELLS (a)

WELL NO.	DATE COMPLETED	ELEVATIONS (IN FEET ABOVE MEAN SEA LEVEL (MSL))						CASING DIAMETER/MATERIAL
		TOP OF PIPE	GROUND SURFACE	TOP OF SCREEN	BOTTOM OF SCREEN	TOP OF SAND PACK	BOTTOM OF SAND PACK	
3T	9/30/82	708.90	706.84	697.84	687.84	698.84	687.84	2.0 PVC
3U	11/13/80	708.72	705.59	676.59	670.59	677.59	669.59	1.0 PVC
4U	5/31/85	676.76	672.93	667.76	657.76	668.93	657.93	2.0 PVC
4L	5/30/85	675.45	672.75	635.45	630.45	637.75	617.75	2.0 PVC
5T	11/13/80	709.86	706.60	704.60	694.60	705.60	693.60	1.0 PVC
5U	11/10/80	709.92	706.74	667.74	662.74	668.74	661.74	1.0 PVC
5L	11/12/80	709.83	706.73	626.73	621.73	628.23	620.23	1.0 PVC
6T*	10/03/75	724.28	723.54	698.54	695.04	721.04	695.04	1.25 STEEL
6U	5/23/85	725.51	723.12	692.51	682.51	696.12	683.12	2.0 PVC
6L	5/13/85	725.71	723.86	638.71	634.21	641.03	633.86	2.0 PVC
7T*	5/24/85	722.04	720.04	715.04	705.04	717.04	705.04	2.0 PVC
8T*	10/08/75	680.11	677.88	654.88	649.88		649.88	1.25 STEEL
9U	8/16/76	673.80	672.20	668.20	658.20		668.20	2.0 PVC
10U*	8/10/76	681.11	677.27	670.77	660.27	672.77	660.27	2.0 PVC
10L	11/04/80	677.55	675.96	635.96	630.96	636.96	629.96	1.0 PVC
11U*	8/10/76	676.08	672.42	667.42	657.42		657.42	2.0 PVC
14T	11/10/80	688.37	685.08	683.08	673.08	684.08	672.08	1.0 PVC
14U	11/10/80	688.40	685.19	657.19	652.19	658.19	650.19	1.0 PVC
14L	11/05/80	688.85	685.49	631.49	626.49	632.49	625.49	1.0 PVC
17T	11/17/80	729.01	727.30	725.30	715.30		714.30	1.0 PVC
17U	11/17/80	729.51	727.51	684.51	679.51	685.51	676.51	1.0 PVC
17L	11/17/80	729.16	727.40	627.40	622.40	629.40	621.40	1.0 PVC
18T	11/10/80	697.71	695.83	693.83	683.83	694.83	682.83	1.0 PVC
18U	11/10/80	697.75	695.85	675.85	670.85	676.85	669.85	1.0 PVC
18L	11/10/80	697.18	695.80	620.80	615.80	622.80	614.80	1.0 PVC
19T	11/05/80	727.41	725.19	717.19	712.19	719.19	711.19	1.0 PVC
19U	11/05/80	726.44	725.11	706.11	700.11	706.11	699.61	1.0 PVC
22U	7/18/84	669.44	667.28	659.28	654.28	660.28	653.28	2.0 PVC
22M	9/30/82	671.15	667.28	648.28	643.28	649.28	642.28	2.0 PVC
22L	9/30/82	670.66	667.23	628.23	623.23	629.23	622.23	2.0 PVC

(a) - Information taken from well logs contained in LRL's Sampling and Analysis Plan (SAP)

(\*) - Well log not included in SAP. Information obtained from other sources supplied by LRL.

TABLE 4 (Cont'd)

## CONSTRUCTION DATA FOR LRL's MONITORING WELLS (a)

WELL NO.	DATE COMPLETED	ELEVATIONS (IN FEET ABOVE MEAN SEA LEVEL (MSL))						CASING DIAMETER/MATERIAL
		TOP OF PIPE	GROUND SURFACE	TOP OF SCREEN	BOTTOM OF SCREEN	TOP OF SAND PACK	BOTTOM OF SAND PACK	
29T	9/30/82	719.91	716.41	701.41	691.41	702.41	691.41	2.0 PVC
29U*	11/21/83	719.83	716.36	680.86	671.61	682.76	670.76	2.0 PVC
29L	11/23/83	719.80	716.11	627.86	622.86	629.01	619.61	2.0 PVC
30T	9/30/82	702.28	699.70	693.70	683.70	694.70	683.20	2.0 PVC
30U	2/03/84	702.04	699.65	660.95	651.75	662.95	651.65	2.0 PVC
30L	12/02/83	701.99	699.53	633.13	628.43	634.13	628.23	2.0 PVC
39U	6/01/84	700.81	685.98	675.23	665.98		665.73	2.0 PVC
40U	6/04/85	673.02	670.72	664.02	659.02	664.72	658.72	2.0 PVC
40L	6/04/85	673.41	670.81	608.81	603.81	611.81	602.81	2.0 PVC
46T	5/30/85	679.54	676.04	671.04	666.54	672.53	664.53	2.0 PVC
46U	5/29/85	678.56	676.47	636.06	631.56	638.47	630.47	2.0 PVC
46L	5/29/85	678.58	676.61	612.08	607.58	616.11	601.61	2.0 PVC
47T	5/24/85	682.19	680.33	672.69	668.19	674.33	667.33	2.0 PVC
47U	5/24/85	682.04	680.11	636.54	632.04	639.61	631.11	2.0 PVC
47L	5/23/85	681.77	679.84	616.27	611.77	618.84	604.84	2.0 PVC
48U	5/07/85	705.80	703.38	673.90	664.70	677.88	664.38	2.0 PVC
48L	5/07/85	705.61	703.24	630.71	626.11	633.34	613.24	2.0 PVC
49U	6/04/85	718.99	717.22	672.49	667.99	676.72	668.22	2.0 PVC
49L	6/03/85	718.93	717.03	629.43	624.93	634.03	622.03	2.0 PVC
58T	4/25/85	675.56	672.35	666.46	657.36	669.35	657.35	2.0 PVC
58U	5/30/85	674.89	671.89	631.89	626.89	632.89	623.89	2.0 PVC
58L	5/29/85	673.82	671.89	606.82	601.82	612.89	602.89	2.0 PVC
50T	5/01/85	692.87	690.47	677.87	673.37	680.47	673.47	2.0 PVC
58L	6/05/85	722.18	720.53	639.18	630.18	644.53	629.53	2.0 PVC
59T	6/03/85	683.43	679.34	674.43	664.43	676.34	664.34	2.0 PVC
59U	5/27/85	681.76	679.59	660.26	655.76	662.59	654.59	2.0 PVC
59L	5/31/85	681.49	679.51	623.99	619.49	726.51	614.51	2.0 PVC
10U	6/01/85	700.81	697.44	679.44	669.44	680.44	667.44	2.0 PVC

(a) - Information taken from well logs contained in LRL's Sampling and Analysis Plan (SAP).

(\*) - Well log not included in SAP. Information obtained from other sources supplied by LRL.

During November 1980, 16 additional monitoring wells were installed. Five wells were screened at the water table (5T, 14T, 17T, 18T, and 19T); six were screened in the upper sand seam (3U, 5U, 14U, 17U, 18U, and 19U); and five in a lower sand seam designated by LRL as the "L" zone (5L, 10L, 14L, 17L, and 18L). Presently, these sixteen wells are included in LRL's State solid waste monitoring systems.

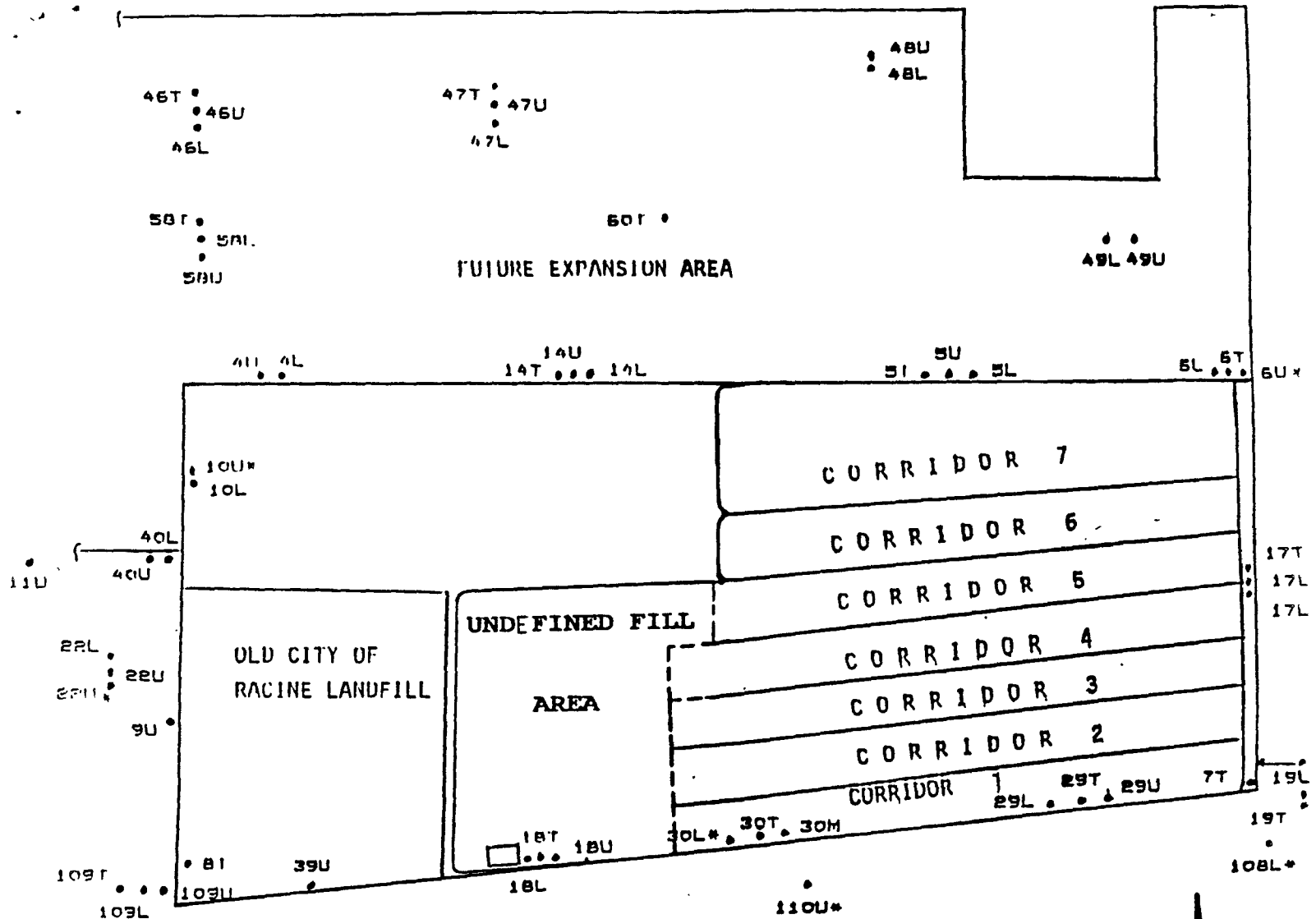
In 1980, LRL also began the practice of installing nested wells. As illustrated in Figure 7, wells were installed near each other (i.e., 5T, 5U, and 5L) and screened in different water bearing units.

Five wells were installed in September 1982. Three wells were screened in the shallow water table (3T, 29T, and 30T), one in the lower sand seam (22L) and one in a unit between the U and L sand seams (22M). This latter well (22M) is included in LRL's RCRA monitoring system as a downgradient well.

In late 1983 and early 1984, LRL installed four additional wells (29U, 29L, 30U, and 30L). These wells were installed as two sets of nested wells with one well in each set being screened in the upper sand and the other in the lower sand. Three of the wells (29U, 30L, and 30U) are part of LRL's solid waste monitoring system are downgradient wells.

Later in 1984, (June, July), two additional wells were installed (39U, and 22U). Both wells were screened in the upper zone and are part of the State solid waste monitoring system.

Finally, from April through June 1985, LRL installed 26 wells. Six were screened in the water table (7T, 46T, 47T, 58T, 60T, and 109T); ten in the upper sand (4U, 6U, 40U, 46U, 47U, 48U, 49U, 58U, 109U, and 110U); and ten in the lower sand (4L, 6L, 40L, 46L, 47L, 48L, 49L, 58L, 108L, and 109L). Wells 6U and 108L have been designated as up-gradient and Well 110U as downgradient RCRA wells. The remaining wells are part of LRL's solid waste monitoring system.



Note: Not to scale.

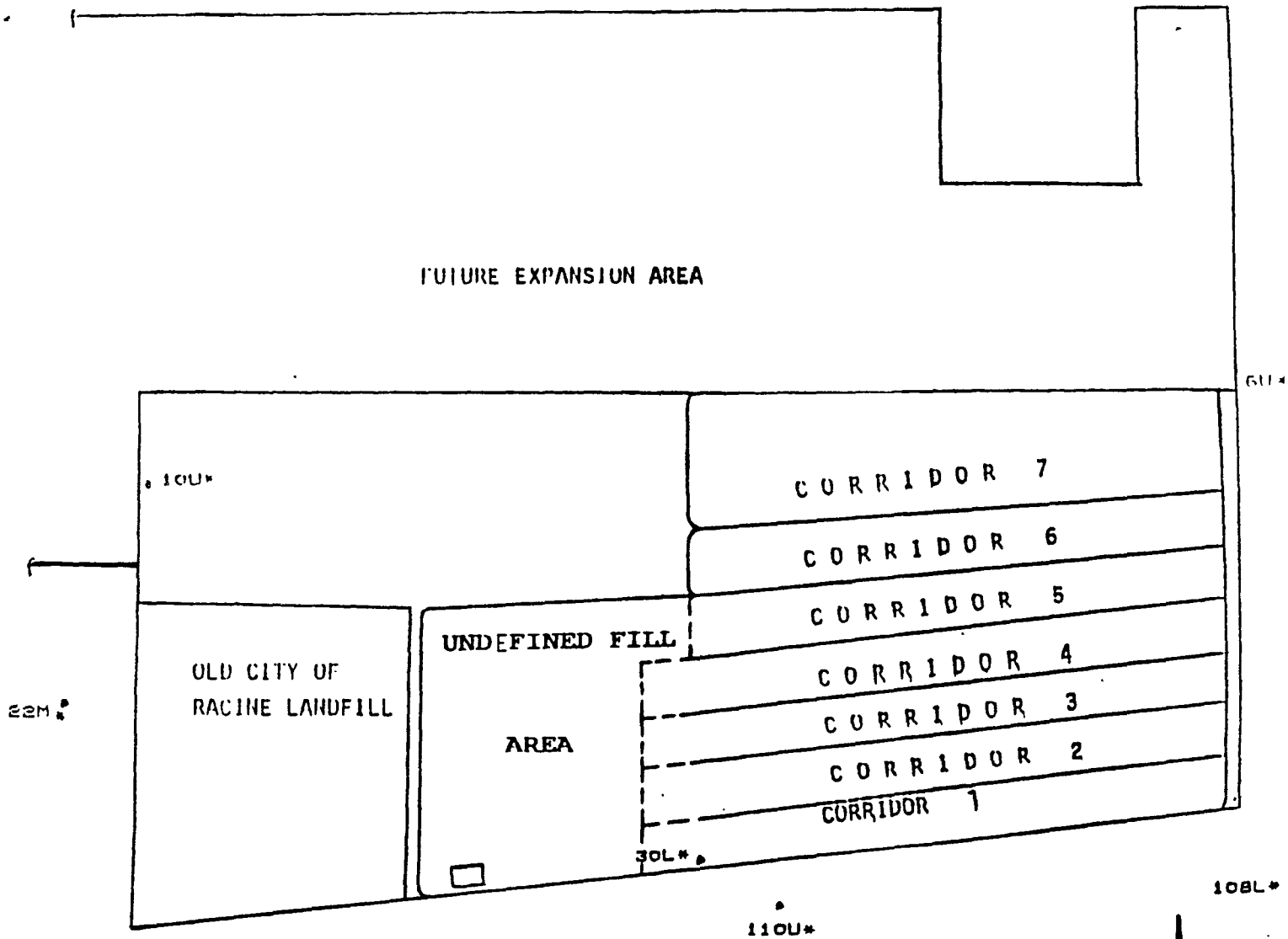
b) Monitoring Well Location

LRL's RCRA ground-water monitoring system consists of six wells as shown in Figure 8.

Upon review of earlier work performed by LRL's contractors, the WDNR, the U.S. EPA, Region V, and its own geological review of the site, the Task Force has determined that the present RCRA ground-water monitoring system is inadequate to immediately detect a release of hazardous waste and/or hazardous waste constituents to the ground-water. This determination is based on information summarized below:

- 1) The six wells in the RCRA system are not sufficient. A greater number of monitoring points is required to provide for a more representative sampling of potential contaminant pathways.
- 2) The site hydrogeology is complex. Three dimensional ground-water flow through layered heterogenous glacial deposits makes determination and monitoring of potential contaminant flow paths difficult.
- 3) The long period of landfilling in the site area since 1963, along with the progressive series of landfill excavations and surface water diversions, have created an area of shifting ground-water potentials and flow paths as well as multiple areas for influx of ground-water contaminants.
- 4) All three geologic units presently monitored by LRL for the WDNR solid waste program could be impacted by a release from the hazardous waste unit. This can be seen in wells along the south side of Corridor 1, where methane gas has been detected. During the construction of Corridors 1 through 5, the water table and upper sand seam were removed from the fill area. Therefore, these units could be connected to the landfill since Corridors 1 through 4 were not constructed using a recompacted clay liner. In addition, the water table and the upper sand seam are upper most water bearing zones relative to the sides of the hazardous waste unit. The lower sand seam, however, is the upper most water bearing unit with respect to the base of the hazardous waste unit.

**FIGURE 8**  
MONITORING WELL LOCATION MAP



\* WELLS DESIGNATED BY LRL AS RCRA MONITORING WELLS

\*\* Wells 19U and 19T are actually 800 feet east of the eastern boundary. This would place wells off of the map.

NOTE: Map not to scale.

- 5) In the present RCRA system, there are only three wells (30L, 108L, and 110U) along the south edge of Corridor 1. All present or future replacement wells along this side, from Well 19U to the series 18 wells, need to be included in the RCRA system. This is needed to detect any releases from the side of fill into the water table or the upper sand seam. Also, as can be seen in Figure 6, the piezometric surface of the lower sand seam, flow is directly south in this lower unit.
- 6) Only two wells (22M and 10U) along the west side of the site area are included in the RCRA monitoring system.
- 7) The two wells that LRL has designated as upgradient (6U and 108L) may be improperly classified. The facility's own data does not support LRL's claim that 6U and 108L are acceptable upgradient wells. Past sampling results for 6U have indicated contamination. Figure 6, the ground-water flow contour map in the lower sand seam, indicates that Well 108L may actually be downgradient. Well 6T also appears to be downgradient and is possibly contaminated as evidenced by WDNR data showing chloride concentrations ranging from 9 to 74 mg/l.

It should be noted that the data shown in Figures 4, 5, and 6, in the previous section, illustrating ground-water flow directions in each of the three monitored zones, indicates that the flow patterns are different for each zone. Therefore, wells in a nest may not have the same gradient designation. For example, of the three wells in the 5 series, Wells 5T and 5U are downgradient and 5L is upgradient of the hazardous waste unit.

c) Background Ground-Water Quality

Many uncertainties exist in the determination of background ground-water quality at the site. The background ground-water at the site cannot be determined only through examination of existing up or downgradient monitoring well locations. The water quality of each well must be compared to both the expected regional water quality data, landfill leachate characteristics, and possible contaminant sources other than the landfill. An additional upgradient well nest (water table, upper and lower units) is necessary to provide more complete determination of background water quality.

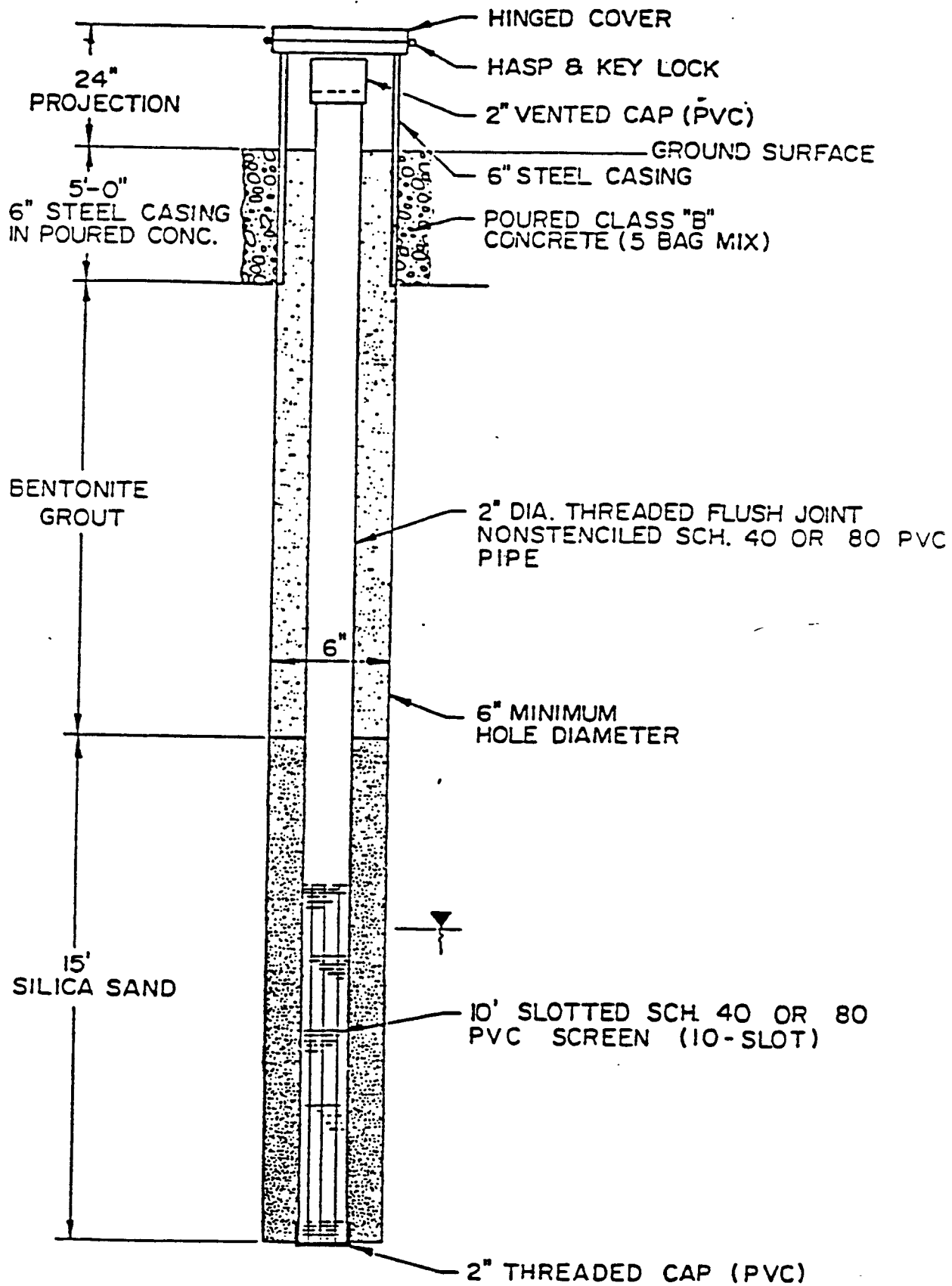
d) Monitoring Well Construction

The ground-water monitoring wells at LRL were installed at eight different time periods between 1976 and 1985. It is difficult to determine from LRL's records if well construction techniques remained the same over these time periods. The well logs included in LRL's Sampling and Analysis Plan (SAP) are incomplete with discrepancies in well details. Many of the logs do not include slot size of the screen, type of sand placed around the screen, nor the elevation for either the top of pipe or ground surface. Also, none of the logs include the type of drilling methods used to bore the hole nor is a description given of the type of development (i.e., pumping or bailing a given number of well volumes) used to clean out the well after construction.

Information from the well logs shows that, after the hole was drilled, slotted schedule 40 or schedule 80 polyvinyl chloride (PVC) pipe was placed in the hole. Sand or pea gravel was then placed around and above the screen section of pipe. Above the sand pack, a bentonite grout seal was added. Near the surface, concrete was added and a steel protective casing was placed around the upper portion of the well. A typical monitoring well is shown in Figure 9.



FIGURE 9



TYPICAL MONITORING WELL

### 3. SAMPLING AND ANALYSIS

#### a) LRL's Sample Collection, Handling, Preservation and Field Measurements

This section will include a review of LRL's Sampling and Analyses Plan (SAP) and observation made by the Task Force of LRL's sample handling procedures. The review of the SAP comments applies to the plan presented to the Task Force during the inspection conducted from August 4 to 8, 1986. The observation of LRL's sampling techniques were made on September 23, 1986, during LRL's quarterly sampling event.

A number of deficiencies were noted in LRL's Sampling and Analyses Plan. These deficiencies are summarized below:

- ° In a number of locations in the SAP, LRL mentions using deionized water. Water that has been only distilled and deionized would not be of sufficient quality for equipment cleaning or preparation of blanks for Volatile Organic Analysis (VOA), Total Organic Halides (TOX), or acid, base/neutral organics. LRL needs to use a high quality water when sampling for these parameters. Also, the purity of the water used needs to be documented in the SAP.
- ° The SAP does not specify when, where, or how long after collection that the dissolved metals samples are filtered. The filtering needs to be completed as soon as possible after sampling. Oxygenation and changes in sample temperature (which effects pH) prior to laboratory filtering may cause the precipitation of some of the metals, thus biasing the sampling results.
- ° The SAP does not give the cleaning procedure used to clean the filtering equipment between samples. This equipment, used to filter dissolved metals samples, needs to be rinsed with a good quality water as-well-as a rinse with nitric acid. For further information,

LRL is referred to references A and C of their SAP. The first reference is Standard Methods for the Examination of Water and Wastewater, and the second is Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020. LRL should follow equipment preparation requirements given in these manuals.

- ° On Table 6, page 23 of the SAP needs to state clearly what specific elements or compounds are included with common anions, minerals, demand parameters and solids.
- ° Holding times for a number of parameters given in Table 6 are incorrect. The parameters, Table 6 holding time, and the EPA required holding times are given below:

<u>PARAMETER</u>	<u>TABLE 6</u>	<u>EPA</u>
Total Suspended Solids (TSS)	28 days	7 days
Biochemical Oxygen Demand (BOD)	28 days	48 hours
PCB and Pesticides	28 days	7 days until extraction, 40 days after extraction
Acid, base neutral priority pollutants	28 days	7 days until extraction, 40 days after extraction

- ° The SAP does not discuss how LRL tracks samples to assure that holding times are met.
- ° Table 6 also states that sodium thiosulfate is added to the VOA and fecal coliform samples. This compound is required only if residual chlorine is suspected to be in the sample. This is unlikely to be the case for ground-water, or leachate samples.
- ° A typing error was noted on Table 6. COP should read COD (for chemical oxygen demand).
- ° Table 6 states that trip blanks are included for VOA samples. The SAP needs to state where these blanks are poured. Trip blanks should be poured in a clean laboratory. Field blanks should not be poured near a well. Field blanks are especially important at wells located near high traffic areas, active landfill areas, or near leachate collection points.
- ° The SAP needs to include a section on quality assurance (QA) and quality control (QC). The following types of QA/QC samples need to be added to LRL's sampling events:
  - 1) Reagent or bottle blanks for metals, TOX, total organic carbon (TOC), nutrients, COD, phenols and acid, base neutral organics.
  - 2) Equipment blanks. After the bailer is cleaned, high quality water should be poured through a bailer and collected in appropriate sample containers. Some of the water should also be run through filtering equipment for a dissolved metals equipment blank.

- 3) The SAP needs to state that additional sample volume be collected laboratory spike and replicate samples.
  - 4) Duplicate field samples need to be taken. Therefore, at 10% of the sample points two complete sets of samples need to be taken as checks for possible errors due to improper sampling techniques.
- ° Page 24 of the SAP states "wells are thoroughly purged of any stagnant water prior to sampling". The SAP needs to state what 'thoroughly' means. During the Task Force observation of LRL's sampling in September 1986, the sampling personnel stated that they purged a well until either three well volumes were removed or the well was dry. The plan needs to include this criteria.
  - ° On page 31, step 11 requires that "the container to be used to store the water sample is to be rinsed with deionized water." What samples are stored in this container? If this is for the storage of samples for pH, temperature, and specific conductance, then it should be stated.
  - ° The SAP needs to give a description of the sampling equipment including dimensions and materials of construction. During our observation of LRL's sampling, we noted their sampling personnel used a bailer made of Teflon.
  - ° The SAP needs to add the maximum amount of time between purging and sampling. Pages 36 and 37 gives a purging and sampling schedule, but does not give a maximum time. During the September 1986 sampling event, LRL stated this was 24 hours.

- ° In the chain-of-custody section, LRL needs to document how samples are shipped to the contract lab, including if samples are kept on ice and how long after sampling they are delivered to the lab.
- ° During the Task Force observation of LRL's sampling technique, it was noted that the sampling personnel wore surgical-type rubber gloves. This needs to be documented in the SAP. These gloves should not contain any talcum powder which could contaminate the samples.
- ° Pages 37 through 39 of the SAP describe LRL's sampling of leachate and surface water techniques. This section needs to include LRL's preservation methods, if any, for these samples, especially for the leachate samples. Preservation of leachate samples with acids (such as nitric acid for metals preservation) can be very dangerous.

The above review of the SAP as well as the Task Force observation of LRL's sampling event in September 1986, indicate that the SAP needs extensive revisions. During the September event LRL's sample personnel performed steps that are not documented in the SAP. These steps, as well as the above deficiencies need to be included in a revised SAP.

b) LRL's Sample Analysis and Data Quality Evaluation

On October 31, 1986, the Task Force Laboratory Evaluation Team performed an onsite evaluation of the CBC-Aqua Search, Division of Chemo-Bio Corporation, Oak Creek, Wisconsin, pursuant to RCRA ground-water monitoring activities for LRL.

° Inorganic Laboratory

The purpose of the evaluation was to establish whether CBC-Aqua Search's standard operating procedures produce data of acceptable quality. CBC-Aqua Search analyzed U.S. EPA Water Supply and Water Pollution Performance Evaluation Samples to demonstrate its analytical capabilities. The laboratory was evaluated for the following inorganic parameters: chloride, iron, manganese, sodium, phenols, sulfate, arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, fluoride, and nitrate.

The following are the observations that were made during the evaluation and the recommendations to CBC-Aqua Search to improve the data quality:

- ° Observation: The laboratory participates in the U.S. EPA Water Supply Pollution Performance Evaluation Studies, and displays consistent errors for inorganic parameter analyses (see Appendix C, Tables C-1, C-2).

Recommendation: The laboratory should develop an intra-laboratory comparison study by periodically analyzing EPA quality control samples.

- ° Observation: The quality control practices for inorganic chemical analyses were reviewed during the on-site evaluation.

Recommendation: A quality assurance program should see that documented approved methodologies exist, that instrument calibration procedures are appropriate, that quality control acceptance criteria are met prior to reporting of final data and that summarized quality control data are effectively evaluated.

- ° Observation: The laboratory acceptance criteria for metals spike recoveries were between 60% and 130%.

Recommendation: The laboratory acceptance criteria for metal spike recoveries should be between 80% and 120%.

- ° Observation: Calibration procedures for atomic absorption spectrophotometers are inadequate. The laboratory composes a calibration curve with only two standard solutions.

Recommendation: A calibration curve should be composed using, at minimum, a reagent blank and three standards.

- ° Observation: The laboratory does not have an EPA approval method for metals performed by Inductively Coupled Plasma spectroscopy.

Recommendation: The laboratory should document and finalize the method as soon as possible.

- ° Observation: The calibration procedure for nitrates by the Auto Analyzer method is inadequate. The laboratory composes a calibration curve with two standard solutions.

Recommendation: A calibration curve should be composed by using, at a minimum a reagent blank and three standards.

- ° Observation: The laboratory does not have a satisfactory assessment of their accuracy and precision.

Recommendation: At least one duplicate sample should be run every 10 samples to verify precision of analytical methods. Also, a spike sample should be analyzed routinely, to verify accuracy of the method.



° Organic Laboratory

The laboratory, CBC Aqua Search, analyzed the LRL's ground-water and leachate samples for total organic carbon (TOC), total organic halide (TOX), pesticides (endrin, lindane, methoxychlor and toxaphene) and herbicides (2,4-D and 2,4,5-TP). In addition, the laboratory analyzed leachate samples for pesticides and PCBs.

The following observations were made during the brief on-site visit:

- ° The laboratory participated in an interlaboratory comparison studies conducted by U.S. EPA and produced results of poor quality. The laboratory performance evaluation results are provided in Appendix C, Table C-3.
- ° The laboratory test procedures and quality control practices are acceptable.
- ° The laboratory has never participated in U.S. EPA Water Supply performance evaluation studies (interlaboratory comparison studies) for drinking water pesticides and herbicides.
- ° The laboratory has not recently participated in U.S. EPA Water Pollution performance evaluation studies for pesticides and it produced unacceptable results for pesticides and PCBs, when participating in the interlaboratory comparison studies.
- ° The laboratory instruments are suitable for the analysis of TOC, TOX, pesticides, herbicides and PCBs.

- ° The laboratory does not have an up-to-date log on the precision and accuracy data collected during the chemical analysis (NOTE: The laboratory should provide precision data by relative percent difference (RPD) so that it would be easier to maintain statistical summaries on all precision data collected.  $RPD = ((\text{Amount Found in Sample 1} - \text{Amount Found in Sample 1 Duplicate}) / (\text{Amount Found in Sample 1} + \text{Amount Found in Sample 1 Duplicate}) / 2)$ ).
- ° The laboratory recently started documenting the status of each analytical instrument in the instrument log books. However, the log books do not provide any information on the sensitivities of the analytical instruments on the day of usage and the number of samples analyzed on each day of usage.

#### 4. GROUND-WATER QUALITY ASSESSMENT

The present RCRA monitoring system is inadequate to detect or assess releases of hazardous waste or hazardous waste constituents. LRL needs to improve its monitoring system and its ground-water assessment procedures.

After the WDNR initiated enforcement action against LRL for failing to statistically analyze the RCRA ground water monitoring data, LRL submitted the report "Land Reclamation, LTD. Environmental Impact Monitoring Plan and Procedures" (dated March 1986). This submittal attempts to explain cause of statistically significant indicators. The pH exceedances were explained as cement grout contamination of the upgradient wells. TOC exceedances at one well were attributed to the wetland immediately above this well. The report concludes that no significant ground-water impacts are occurring at the site.

The report failed to mention some other statistically significant exceedances. The reports statistics show TOC exceedances for wells 10U and 30L. These exceedances should have triggered LRL into performing a ground-water quality assessment monitoring as required by NR 181.49(5)(h).

If the pH values were biased by the cement grout contamination, the grout contamination should also have affected the specific conductivity values. No statistically significant exceedances were noted for conductivity due to the grout contamination. LRL was unable to provide an acceptable means for evaluating the TOX data. All background sampling showed that the TOX level was below the analytical detection limit. Since the background data was below detection, LRL did not attempt to statistically analyze the down-gradient wells. Furthermore, Well 22U showed numerous samples above the detection limit, LRL should have prepared a ground-water assessment.

#### G. MONITORING DATA ANALYSIS FOR INDICATIONS OF WASTE RELEASE

##### TASK FORCE DATA

During the inspection, samples were collected by U.S. EPA's contractor to determine if the ground-water contained hazardous waste constituents or other indicators of contamination. Water was collected from 17 monitoring wells, one surface water location listed in LRL's WPDES permit, and one leachate man-hole. An additional 38 wells were measured for water level only to construct ground-water contour maps shown in Figures 3, 4, and 5.

Samples collected by the Task Force shows that a release of hazardous constituent has probably occurred.

Most of the detected organic compounds do not naturally occur in the environment. Task Force sampling of the upgradient wells showed that the organic compounds were not detectable. However, Well 39U had many identifiable and quantifiable organic compounds. As noted below nine wells contained lead or chromium levels above the limits listed in Table X NR 181.49(5) (40 CFR Part 265, Appendix III).

Field measurements were made by the U.S. EPA contractor, Versar, Inc., at the time of sampling for pH, specific conductance and turbidity. Laboratory analysis results were obtained from two U.S. EPA Contractor Laboratories participating in the Contact Laboratory Program. Specific organic compounds were analyzed at Compuchem Laboratories, Inc., and metals and other parameters at Centec Laboratories. Table A-1 gives a summary of analytical techniques and reference methods, by parameter, for sample analyses and Table A-2 gives the detection limits for all organic compounds.

Standard quality control measures were taken including: (1) the analysis of field and laboratory blanks to allow the determination of possible contamination due to sample handling, (2) analysis of laboratory-spiked samples to estimate accuracy, (3) analysis of both laboratory and field duplicates to estimate precision, and (4) the review and interpretation of the results of these control measures, Appendix B.

#### a) Metals Analytical Results

Nine wells contained chromium or lead results above levels given in Table X, (50 ug lead, 50 ug/l chromium) NR 181.49 (5) Wis. Adm. Code (40 CFR Part 265, Appendix III). Wells that contained lead results above the 50 ug/l limit given in Table X, were 14U(108 ug/l), 14L (66 ug/l), 29L(51 ug/l), 39U(165 ug/l), and the leachate sample (52.2 ug/l). Wells found with chromium above the Table X limits of 50 ug/l were 6U(98 ug/l), 14U (195 ug/l), 14L(102 ug/l), 40U(56 ug/l), 40U(Dup)(54 ug/l), 40L(107 ug/l),

and 40L(dup)(116 ug/l). The laboratory has characterized the lead results as semiquantitative due to deviations in quality control requirements. The chromium results for the above wells have been rated as quantitative. Further descriptions of data usability and quality control is given below.

A comparison of dissolved metals data (Table 5) for the facility designated upgradient wells (6U and 108L) with a number of their downgradient wells, indicates possible releases of arsenic, barium, cadmium, and chromium to the ground-water.

The only other metals found in high concentrations were those usually found in ground-water (aluminum, calcium, iron, magnesium, potassium, and sodium). All dissolved and total metals results are summarized in Appendix B.

#### b) Inorganic And Indicator Parameter Results

Field measurements were conducted by U.S. EPA's contractor for pH, temperature, specific conductance, and turbidity. This data along with the remaining inorganic and indicator parameters are summarized in Table A-5 of Appendix A. With the exception of two wells, pH results were in the range of 6.6 to 8.4. Well 10U had a pH of 6.17 and the pH of Well 39U was 10.45. Specific conductivity ranged from a low of 190 umhos/cm (Well 29L) to a high of 2607 umhos/cm (Well 22L). Turbidity results were less than 40 NTUs with three exceptions, Well 30L (260 NTU), Well 39U (100 NTU), and Well 110U (200 NTU).

Inorganic and indicator parameters varied greatly from well to well. Generally, constituents normally found in ground-water, (sulfate, chloride and bromide) were found in high concentrations. Ammonia varied from undetected to 35 mg/l. Five wells had elevated total phenol levels, Well 9U (100 ug/l), 39U (272 ug/l), 40U (105 ug/l), 40U (DUP) (105 ug/l), and the leachate (1100 ug/l). Total organic carbon (TOC) concentrations ranged 2.6 mg/l (Well 40L) to 728 mg/l (leachage). Both TOC and total phenols were found in some blanks above the detection limit.

T A B L E 5

COMPARISON OF DISSOLVED METALS DATA FROM  
UPGRADIENT WELLS (6U, 108U) AND DOWNGRADIENT WELLS

<u>UPGRADIENT *</u>		<u>DOWNGRADIENT *</u>	
<u>WELL - CONCENTRATION (ug/l)</u>		<u>WELL - CONCENTRATION (ug/l)</u>	
<u>A R S E N I C</u>			
6U	- ND	40L	- 10.6
108L	- ND	109U	- 6.4
		14U	- 6.3
		39U	- 22.9
		29L	- 6.4
		40U	- 21.0
<u>B A R I U M</u>			
6U	- 77	9U	- 167
108L	- 332	10U	- 248
		14U	- 247
		22U	- 353
		29U	- 244
		39U	- 848
		40U	- 92
		109U	- 140
		1100	- 169
<u>C A D M I U M</u>			
6U	- ND	22L	- 0.5
108L	- ND	30L	- 3.1
		40L	- 1.2
<u>C H R O M I U M</u>			
6U	- 19	14U	- 20
108L	- 21	22U	- 39
		29U	- 27

ND - Not detected above method detection limit.

\* - Well designated as given by LRL.

c) Organic Analytical Results

With only one exception, which is given below, the only volatile organics found in any of the ground-water samples were low levels of toluene (not detected to 12 ug/l) and acetone (not detected to 48 ug/l). The exception was downgradient Well 39U, which contained the following organic compounds.

<u>VOLATILE COMPOUND</u>	<u>CONCENTRATION (ug/l)</u>
Acetone	48
Benzene	10
trans, 1, 2-dichlorethene	11
Ethyl Benzene	14
Tetrachloroethene	11
Toluene	12
Trichloroethene	8.8
Xylene	70

<u>SEMIVOLATILE COMPOUND</u>	<u>CONCENTRATION (ug/l)</u>
2,4-Dimethyl Phenol	28
2-Methyl Phenol	4.8
4-Methyl Phenol	21

<u>PESTICIDE COMPOUND</u>	<u>CONCENTRATION (ug/l)</u>
4-4' - DDD	12
Dieldrin	15

These compounds were all greater than the values found in the upgradient well in this unit. This is an indication of a release of these constituents from the facility to the ground-water. Two other organic compounds 1,1 dichloroethane (2 ug/l) and 4-methyl-2-pentanone (6.5 ug/l) were detected in Well 39U, but below the contract required detection limits. For these last two compounds, the mass spectral data indicated the compound was present above zero but below the detection limit.

For all wells, except 39U, the only semi-volatile organics found were bis (3-ethylhexyl) phthalate, and di-N-butyl phthalate. Well 39U contained 2-methylphenol (4.8 mg/l), 4 methylphenol (21 mg/l) 2,4-dimethylphenol (28 mg/l) and phenol (by GC/MS) (52 mg/l). In addition, Well 39U contained a number of other semi-volatile compounds above zero but below the contract detection limit (see data in Appendix B).

Of the ground-water samples, only Well 39U indicated the presence of the pesticides, dieldrin (12 mg/l) and 4-4'-DDD (15 mg/l), data summarized in Appendix B.

The only organic compounds found in the surface water sample, were acetone (10 mg/l) and di-N-butyl phthalate (2 ug/l), see Appendix B.

The leachate sample contained nine volatile organics above the detection limit. These were toluene (1000 mg/l), acetone (2100 mg/l) methylene chloride (230 mg/l), 2-butanone (2200 mg/l), 1,1 dichloroethane (220 mg/l), trans-1,2-dichloroethene (210 mg/l), 4 methyl-2-pentanone (210 mg/l), ethyl benzene (120 mg/l), and xylenes (420 mg/l). One compound, 1,1,1 - trichlorethane (53 mg/l) was found above zero but below the detection limit.

The leachate also contains three semi-volatile organics above the method detection limit and 23 other compounds above zero but below the detection limit. The three compounds found above the detection limit are phenol (by GC/MS) (190 mg/l), bis(2-ethylhexyl) phthalate (110 mg/l), and 4-methylphenol (850 mg/l).



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- 4) WDNR Approval Letter of Corridor No. 6  
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- 5) RMT Report Hazardous Waste Management  
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A P P E N D I X   A

ANALYTICAL TECHNIQUES AND TABULATED SUMMARY  
OF TASK FORCE OBSERVATIONS FOR MONITORING  
WELLS SAMPLED DURING THE INSPECTION  
LAND RECLAMATION, LTD., RACINE, WISCONSIN

Table A-1  
Sample Preparation and Analysis Techniques and Methods

Parameter	Preparation Technique	Analysis Technique	Method Reference
Conductance	None	Electrometric, Wheatstone Bridge	Method 120.1 (a)
pH	None	Potentiometry	Method 150.1 (a)
Turbidity	None	Nephelometry	No reference
OR	None	Purgable combust, Microcoulometry	EPA 600/4-84-008
OR	Carbon absorption	Carbon combust, Microcoulometry	Method 9020 (b)
OC	None	Purgable combust, Non-dispersive Infrared	No reference
PUC	Acidify and purge	Liquid combust, Non-dispersive Infrared	Method 415.1 (a)
Ammonia	Particulates settled	Phenolate Colorimetry of supernatant	Method 350.1 (a)
Chloride	Particulates settled	Mercuric Precipitation Filtration of supernatant	Method 9252 (b)
Nitrate	Particulates settled	Brucine Sulfate Colorimetry of supernatant	Method 9200 (b)
Sulfate	Particulates settled	Barium Sulfate Turbidimetry of supernatant	Method 9018 (b)
Cyanide	Manual distillation	Pyridine Barbituric Acid Colorimetry	CLP Method (c)
Phenol	Manual distillation	Ferricyanide 4-Aminoantipyrine Colorimetry	Method 420.1 (a)
Mercury	Wet digestion for dissolved and total	Cold Vapor Atomic Absorption Spectroscopy	CLP Method
Cd, Pb, Se and Fl	Acid digestion for total	Furnace Atomic Absorption Spectroscopy	CLP Method
Other Elements	Acid digestion for total	Inductively Coupled Plasma Emission Spectroscopy	CLP Method
Volatiles	Purge and trap	Gas Chromatography with Electron Capture Detection	CLP Method
	Direct Injection	Gas Chromatography - Mass Spectroscopy or	CLP Method
		Gas Chromatography with Flame Ionization Detection	CLP Method
Semi-volatiles	Methylene chloride extraction	Gas Chromatography - Mass Spectroscopy	CLP Method
Pesticides/PCB	Methylene chloride/hexane extraction	Gas Chromatography with Electron Capture Detection	CLP Method
Pesticides	Diethylether extraction/methylation	Gas Chromatography with Electron Capture Detection	Method 8150 (b)

- ) Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.
- ) Test Methods for Evaluating Solid Wastes, SW-846.
- ) Contract Laboratory Program, IFB methods.

a Measured as AMPHETAMINE  
b Measured as DIPHENYLAMINE  
c Not Analyzed

-A-3-

T A B L E   A - 3

CONTRACT REQUIRED DETECTION LIMITS (CRDL) AND INSTRUMENT  
DETECTION LIMITS (IDL) FOR METALS, INORGANIC, AND INDICATOR PARAMETERS

PARAMETERS	CRDL (ug/l)	IDL (ug/l)
<u>METALS</u>		
Aluminum	200	100
Antimony	60	3
Arsenic	10	6
Barium	200	4
Beryllium	5	4
Cadmium	5	0.5
Calcium	5000	93
Chromium	10	8
Cobalt	50	16
Copper	25	12
Iron	100	10
Lead	5	2
Magnesium	5000	238
Manganese	15	3
Mercury	0.2	0.2
Nickel	40	20
Potassium	5000	2160
Selenium	5	3
Silver	10	10
Sodium	5000	156
Thallium	10	5
Vanadium	50	21
Zinc	20	12
<u>INORGANIC AND INDICATORS</u>		
Ammonia nitrogen	100	10
Bromide		50
Chloride	1000	1000
Cyanide	10	
Nitrate nitrogen	300	300
Nitrite nitrogen		50
POC	10	100
POX	5	5
Sulfate	1000	500
TOC	1000	1000
TOX	5	5
Total Phenols	10	10

T A B L E   A - 4

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SUMMARY OF OBSERVATIONS MADE DURING SAMPLING OF LRL MONITORING WELLS

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WELL NO.	DATE/TIME	REMARKS
6U	8/04/86            1335 - 1432	Water clearer than original purge water, which was a tan/brown color. LRL given split for VOA, POC, POX, and extractable organics.
6L	8/05/86            1042 - 1115	On 8/4/86, while purging, the bailer separated from the sample line. Bailer was not recovered until late in the day, therefore, well was completely repurged on 8/5/87 before sampling. Water was tan/brown in color. LRL given split for VOA, POC, POX, and extractable organics.
9U	8/07/8            1130 - 1145 1510 - 1528	VOA, POC, and POX taken. Facility given split for VOA, POC, and POX. Extractable organics, Total and dissolved metals, and TOC taken.
	1510 - 1528	Extractable organics, Total metals, dissolved metals, and TOC collected. Facility given split for extractable organics.
	8/08/86            0850 - 0909	TOX, phenols, cyanide, sulfate/chloride and nitrate/ammonia collected.
10U	8/06/87            1325 - 1410	Cloudy and rainy, Splits given to facility for VOA, POC, POX, and extractable organics.
14U	8/05/86            1150 - 1340	Water slightly grey in color. Had to use a 3/4 inch bailer which made purging and sampling very slow. Splits given to LRL for VOA, POC, PXO, and extractable organics.

T A B L E    A - 4    (Cont'd)

SUMMARY OF OBSERVATIONS MADE DURING SAMPLING OF LRL MONITORING WELLS

WELL NO.	DATE/TIME	REMARKS
14L	8/05/86            1239 - 1405	Water mild grey-brown in color. Use of a 3/4 inch bailer made purging and sampling slow. Splits given to LRL for VOA, POC, POX, and extractable organics.
22U	8/06/86            1605 - 1645	Cloudy and rain. Well located in a swampy area. Water had a mild brown color. Splits given to LRL for VOA, POC, POX, and extractable organics.
22L	8/06/86            1702 - 1800	Cloudy and rain. Well located in a swampy area. Well bailed dry at 1600. After allowing an hour for recharge, there was only enough water for VOA, POC, and POX with a split being given to LRL.
	8/07/86            1020 - 1100	Finished collecting remaining parameters, including giving LRL a split for extractable organics. Chain-of-Custody lost during shipment.
22U	8/05/86            1458 - 1526	Split given to LRL for VOA, POC, POX, and extractable organics.
29L	8/05/86            1542 - 1612	A fine particulate matter was noted floating on the water surface during the collection of TOX sample. A split was given to LRL for VOA, POC, POX, and extractable organics.
	1627 - 1637	Poured first of two field blanks near this well. Splits given to LRL for VOA, POC, POX, and extractable organics.

T A B L E    A - 4    (Cont'd)

SUMMARY OF OBSERVATIONS MADE DURING SAMPLING OF LRL MONITORING WELLS

WELL NO.	DATE/TIME	REMARKS
30L	8/06/86            1010 - 1045	Rainy and windy. Split given to LRL for VOA, POC, POX, and extractable organics.
39U	8/06/86            1232 - 1300	Extra volume of samples taken for VOA and extractable organics so laboratory can perform lab duplicate and matrix spike. Splits given to LRL for VOA, POC, POX, and extractable organics.
40U	8/07/86            1059 - 1142	Field duplicate collected at this well. Therefore, two complete sets of samples taken. Split, including the duplicate, was given to LRL for VOA, POC, POX, and extractable organics.
40L	8/07/87            1150 - 1222	Due to loss of Chain-of-Custody of samples during shipment, lab was told to discard this sample.
	8/08/86            1247 - 1331	Well was repurged and resampled. Also, the the second field duplicate was collected here, to replace the duplicate lost at Well 109U. Splits given to LRL for VOA, POC, POX, and extractable organics.
	8/08/86            1225	Field blank poured near this well. A split was given to LRL for VOA, POC, POX, and extractable organics.
108L	8/04/86            1650 - 1712	Splits given to LRL for VOA, POC, POX, and extractable organics.
109U	8/07/86            1525 - 1606	Well at edge of road. Heavy machinery operating during purging and sampling. A field blank and field duplicate were collected. Splits were given to LRL for VOA,



T A B L E   A - 4   (Cont'd)

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SUMMARY OF OBSERVATIONS MADE DURING SAMPLING OF LRL MONITORING WELLS

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WELL NO.	DATE/TIME	REMARKS
109U (cont'd)		POC, POX, and extractable organics. During shipment, Chain-of-Custody was lost on the field blank and one set of samples. The labs were told to discard these samples. The duplicate sample taken from this well remained under custody and the data is summarized in Tables A-4 through A-7. The second field blank was then collected on 8/8/86 at Well 40L.
110U		
	8/06/86	1325 - 1343
		Rainy and windy. Well purged dry at 0934. Well was still dry at 1030. Samples collected for VOA, POC, POX, and part of the extractable organics. Splits given to LRL for VOA, POX, POX, and extractable organics.
	8/07/86	0820 - 832
		Remainder of samples collected.
Surface Water		
	8/08/86	1055 - 1106
		Collected samples from surface water near where LRL takes samples for their NPDES Permit. Splits given to facility for VOA, POC, POX, and extractable organics.
Leachate		
	8/08/86	1245
		Full set of samples taken from one of the facility's leachate sumps. Sample team wore level B safety protection (self-contained breathing apparatus and protective clothing). Splits given to LRL for VOA, POC, POX, and extractable organics.
Equipment Blank		
	8/05/86	1450
		High performance liquid chromatography (HPLC) grade water was poured through a clean

T A B L E   A - 4   (Cont'd)

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SUMMARY OF OBSERVATIONS MADE DURING SAMPLING OF LRL MONITORING WELLS

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WELL NO. DATE/TIME		REMARKS
Equipment Blank (cont'd) 8/95/86	1450	bailer, and bottles were filled for all parameters listed in Table 1. This was done at the U.S. EPA contractor's truck which was located near the entrance to the landfill.
Field Blank 8/05/86	1627 - 1637	HPLC grade water was poured into sample containers near Wells 29U, and 29L, and labeled as a field blank. A split was given to LRL for VOA, POC, POX, and extractable organics.
Field Blank 8/07/86	1013	Field blank collected near Well 109U, but Chain-of-Custody lost during shipment. Lab told to discard sample.
Field Blank 8/08/87	1225	HPLC grade water was poured into sample containers for all parameters near Well 40L. A split was given to LRL for VOA, POC, POX, and extractable organics.
Trip Blank 8/01/86	1400	At the lab of the U.S. EPA sample contractor, a full set of sample containers were filled with HPLC grade water. These containers were taken to the site and kept in the contractor's truck located near the landfill entrance. Containers were not open while on site. On 8/7/86, these containers were shipped to the laboratory and labeled as a Trip blank.

T A B L E A - 5

SUMMARY OF PURGE DATA COLLECTED

FROM WELLS AT LRL

WELL NUMBER	MEASURED * DEPTH OF WELL (ft)	MEASURED DEPTH TO WATER SURFACE (ft)	ELEVATION OF WATER SURFACE (ft above MSL)	PURGE VOLUME CALCULATED (gal)	PURGE VOLUME ACTUALLY Removed (gal)	PURGING		REMARKS
						DATE	TIME	
6U	45.05	17.84	707.67	13.05	13.3	8/04/86	1145-1432	Water tan/brown in color, heavy sediment
6L	89.65	58.00	667.71	15.19	—	8/04/86	1035-1113	Water tan/brown in color heavy sediment. Lost bailer at 1113. Recovered bailer at 1745
	89.65	58.00	667.71	15.19	15.2	8/05/86	0830-0941	Repurged 3 well volumes then sampled
9U	14.92	6.51	667.29	4.04	2 (Dry)	8/07/86	0920-0948	Water had a slight grey color. Bailer lost during purging, but recovered and well purged dry. Sampling started 2 hrs. later after well recovered.
10U	20.2	14.17	666.94	2.95	3.0	8/06/86	1240-1250	Water clear, weather rainy.
14U	31.87	23.75	664.65	0.97	1 gal	8/05/86	1010-1045	Water slightly grey. 3/4 inch bailer used, purging and sampling slow.

\* Depth measured during the inspection and may not agree with Figures in Table 4, due to sedimentation.

TABLE A - 5 (Cont'd)  
SUMMARY OF PURGE DATA COLLECTED  
FROM WELLS AT LRL

WELL NUMBER	MEASURED * DEPTH OF WELL (ft)	MEASURED DEPTH TO WATER SURFACE (ft)	ELEVATION OF WATER SURFACE (ft above MSL)	PURGE VOLUME CALCULATED (gal)	PURGE VOLUME ACTUALLY Removed (gal)	PURGING		REMARKS
						DATE	TIME	
14L	61.33	25.00	663.85	4.36	4.5	8/05/86	0950-1140	Water had a mild grey/ brown color. Used a 3/4 inch bailer, purge and sample very slow.
22U	14.77	3.83	665.61	5.25	3.0 (Dry)	8/06/86	1530-1537	Well in swampy area. Wa- ter mild brown color. Weather clody, rainy. Well purged dry before 3 well volumes removed.
22L	46.08	6.08	664.58	19.2	7 gal	8/06/87	1545-1600	Water was mild/ tan/grey color, well purged dry. Weather, rainy. Well in swampy area.
29U	46.67	22.40	697.43	11.6	8.0 (Dry)	8/05/87	1222-1241	Slight amount of sedi- ment. Well purge dry be- fore 3 well volumes re- moved.
29L	95.60	58.65	661.15	17.7	18.0	8/05/87	1310-1422	Water clear.

\* Depth measured during the inspection and may not agree  
with Figures in Table 4, due to sedimentation.

TABLE A - 5 (Cont'd)  
SUMMARY OF PURGE DATA COLLECTED  
FROM WELLS AT LRL

WELL NUMBER	MEASURED * DEPTH OF WELL (ft)	MEASURED DEPTH TO WATER SURFACE (ft)	ELEVATION OF WATER SURFACE (ft above MSL)	PURGE VOLUME CALCULATED (gal)	PURGE VOLUME ACTUALLY Removed (gal)	PURGING		REMARKS
						DATE	TIME	
30L	74.33	40.33	661.66	16.2	16.7	8/06/87	0920-1007	Water slightly turbid. Weather, rainy and windy.
39U	21.08	13.69	687.12	3.25	6.0	8/06/86	1008-1023	Due to heavy tan sedi- ments, the well was purged on extra 3 well volumes before sampling.
40U	15.45	6.75	666.27	4.2	4.5	8/07/87	0494-0959	
40L	63.7	8.2	665.21	27.5	27.5	8/08/87	1152-1243	First set of samples taken on 8/8/87 had to be discarded due to loss of Chain-of-Custody dur- ing shipment. This is second sampling effort.
108L	88.77	61.32	660.9	13.2	13.5	8/04/87	1600-1630	Water had heavy tan/ brown sediments.
109U	26.30	11.51	669.98	7.1	7.5	8/07/86	1420-1437	Water contained heavy tan/brown sediments.
110U	31.70	11.85	688.96	10.0	4.0(Dry)	8/06/87	0920-0934	Well purged dry after 4 gallons removed. Weath- er, rainy and windy.

\* Depth measured during the inspection and may not agree  
with Figures in Table 4, due to sedimentation.

A P P E N D I X B

"EVALUATION OF QUALITY CONTROL ATTENDANT TO THE ANALYSIS  
OF SAMPLES FROM THE LAND RECLAMATION, WISCONSIN FACILITY",

DECEMBER 18, 1986, PRC ENGINEERING

LAND RECLAMATION, LTD., RACINE, WISCONSIN



**Planning Research Corporation**

**PRC Engineering**

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**December 18, 1986**

**Mr. Anthony Montrone  
Hazardous Waste Ground-Water  
Task Force (WH-562A)  
U.S. EPA  
401 M Street, S.W., Room S-301  
Washington, D.C. 20460**

**Dear Mr. Montrone:**

PRC Environmental Management, Inc. are pleased to submit for your review the final memorandum for QA/QC support of Work Assignment No. 548 entitled "Evaluation of Quality Control Attendant to the Analysis of Samples from the Land Reclamation, Wisconsin Facility."

If you have any questions regarding this submittal, please feel free to contact us.

Sincerely,

PRC Environmental Management, Inc.

*Stanley Jabrinski*

for Daniel T. Chow

DTC/cvh

cc: Nancy Deck (w/1 copy of report)  
Bruce Bakaysa (letter only)  
Barbara Elkus (w/1 copy of report)  
Rich Steimle (w/1 copy of report)  
Paul Friedman (w/1 copy of report)  
Ken Partymiller (w/copy of report)  
Brian Lewis (w/1 copy of report)  
Gareth Pearson (w/1 copy of report)  
Chuck Hoover (w/1 copy of report)  
James Adams, Jr. (w/1 copy of report)  
John McGuire (w/1 copy of report) ✓  
Ed Berg (w/1 copy of report)



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**ENFORCEMENT  
CONFIDENTIAL**

**EVALUATION OF QUALITY CONTROL ATTENDANT  
TO THE ANALYSIS OF SAMPLES FROM THE  
LAND RECLAMATION, WISCONSIN FACILITY**

**FINAL MEMORANDUM**

**Prepared for**

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
Office of Waste Programs Enforcement  
Washington, D.C. 20460**

Work Assignment No. : 548  
EPA Region : Headquarters  
Site No. : N/A  
Date Prepared : December 18, 1986  
Contract No. : 68-01-7037  
PRC No. : 15-5480-05  
Prepared By : PRC Environmental  
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**PRIVILEGED WORK PRODUCT PREPARED  
IN ANTICIPATION OF LITIGATION**





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**MEMORANDUM**

**DATE:** December 17, 1986

**SUBJECT:** Evaluation of Quality Control Attendant to the Analysis of Samples from the Land Reclamation, Wisconsin Facility

**FROM:** Ken Partymiller, Chemist  
PRC Environmental Management

**THRU:** Paul H. Friedman, Chemist\*  
Studies and Methods Branch (WH-562B)

**TO:** HWGWTF: Tony Montrone\*  
Gareth Pearson (EPA 8231)\*  
Richard Steimle\*  
Ed Berg (EPA 8214)\*  
James Adams, Jr., Region V  
John McGuire, Region V  
Brian Lewis

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 Land Reclamation, Wisconsin 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 (2-3) 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 presents 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

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\* HWGWTF Data Evaluation Committee Member

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 accompanying reports (2-3). 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.

### **I. Site Overview**

The Land Reclamation facility is located in Racine, Wisconsin. The landfill is on an eighty-one acre site and has been in operation since 1970. The landfill is situated on a glacial ridge which consists of silty-clay loam containing little sand or gravel so contaminant migration is expected to be slow. Hazardous wastes were accepted at the facility until 1982. Types of hazardous wastes accepted, according to the facility's Part A Permit Application, include ignitable wastes, metals, spent halogenated solvents, non-halogenated solvents, electroplating wastes, pickle liquors, ethylhexylphthalate, tetrachloroethylene, and trichloroethane. The facility is in Detection Monitoring which means that there has been no indication of leakage from the site according to the data submitted by the facility. Some violations of Interim Status standards have occurred including problems with the adequacy of the ground-water monitoring system and several of the Federal Facility Standards.

An old city landfill is located next to the hazardous waste site. This unlined landfill may have accepted hazardous wastes. Contamination from this site may be impacting some of the Land Reclamation wells as contamination has been seen previously at some of the wells located between the two sites. Some of the Land Reclamation up-gradient wells have shown possible contamination and may not be true "up-gradient" wells.

Twenty-five field samples including two field blanks (MQO560/QO560 and MQO577/QO577), one equipment blank (MQO559/QO559), one trip blank (MQO796/QO796), and two pairs of duplicate samples (well 40U, MQO569/QO569 and MQO570/QO570 and well 40L, MQO578/QO578 and MQO579/QO579) were collected at this facility. Sample MQO580/QO580 is a medium concentration leachate sample. Sample MQO576/QO576 is a low concentration surface water sample. All other samples were low concentration ground-water samples.

### **II. Evaluation of Quality Control Data and Analytical Data**

#### **1.0 Metals**

#### **1.1 Performance Evaluation Standards**

Metal analyte performance evaluation standards were not evaluated in conjunction with the samples collected from this facility.

## **1.2 Metals QC Evaluation**

Total and dissolved metal spike recoveries were calculated for twenty-three metals spiked into six low concentration ground-water samples (MQO558, 563, 569, 570, 578, and 579) and one medium concentration leachate sample (MQO580). Not all metals were spiked into each of these samples and separate samples were spiked for the total and dissolved metal ground-water samples. Nineteen of the twenty-three total metal average spike recoveries and all seventeen of the dissolved metal average spike recoveries from the low concentration ground-water samples were within the data quality objectives (DQOs) for this Program. In the low concentration ground-water samples, the total selenium and silver average spike recoveries were outside DQO with values of 47 and 332 percent, respectively. The total aluminum and iron spike recoveries were not calculated as the sample concentrations of these metals were greater than four times the concentration of the spike. Various individual metal spike recoveries from the ground-water samples were also outside DQO. These are listed in Table 3-2a of Reference 2 as well as in the following Sections. A listing of which samples were spiked for each analyte is also available in Table 3-2a of Reference 2.

Nineteen of the twenty-three total metal spike recoveries and twelve of the seventeen dissolved metal spike recoveries from the medium concentration leachate spiked sample (only the single sample was spiked) were within DQO. In the leachate sample the total selenium and dissolved silver spike recoveries were outside DQO with values of 46 and 64 percent. The total aluminum, iron, and lead, and dissolved iron, magnesium, potassium, and sodium spike recoveries were not calculated because the sample concentrations of these metals were greater than four times the concentration of the spike.

All reported laboratory control sample (LCS) recoveries and all calibration verification standard (CVS) recoveries were within Program DQOs.

The calculable average relative percent differences (RPDs) for metallic analytes in ground-water samples, except total chromium and lead and dissolved aluminum and iron, were within Program DQOs. The calculable RPDs for all metallic analytes in the leachate sample, except total aluminum, were within the DQOs. RPDs were not calculated for about one-half of the metal analytes because the concentrations of many of the metals in the field samples used for the RDP determination were less than the CRDL.

Required analyses were performed on all metals samples submitted to the laboratory.

No contamination was reported in the laboratory blanks. A trip blank (MQO796) contained 25 ug/L of total chromium and an equipment blank (MQO559) contained 11 ug/L of dissolved chromium. Both of these values are above the CRDL.

## **1.3 Furnace Metals**

The graphite furnace metals (antimony, arsenic, cadmium, lead, selenium, and thallium) quality control, with exceptions, was acceptable.

Duplicate injection precision for antimony was poor for samples MQO558, 578, 579, and 580Dup (the duplicate leachate analysis). All total and dissolved antimony results should be considered quantitative.

The total arsenic spike recovery for sample MQO563 was outside DQO with a recovery of 66 percent. The method of standard addition (MSA) correlation coefficient for dissolved arsenic in sample MQO570 was outside control limits. There was suspected interference in this analysis due to the presence of large concentrations of sulfate. Dissolved arsenic results for this sample (MQO570) should not be used. All dissolved arsenic results, with the exception of sample MQO570, should be considered quantitative. Due to variable total arsenic spike recoveries, all total arsenic results should be considered semi-quantitative.

The cadmium results, recorded on Form 3, for three continuing calibration blanks (CCBs) were slightly different than the values reported in the raw data. This has no impact on data quality. All cadmium results should be considered quantitative.

The correlation coefficient for the MSA analysis of total lead in sample MQO580Dup was outside of DQO. Laboratory duplicate RPDs or absolute differences for total lead in samples MQO563 and 578 were outside DQO. The duplicate injection relative standard difference (RSD) for dissolved lead in sample MQO563Dup was outside DQO. There were deviations in the control limits for one set of continuing calibration verifications (CCVs) and CCBs for the lead analysis. Samples MQO560, 561, 563, 566, and 568 were run after the unacceptable CCV and CCB and total lead results for these samples should be considered semi-quantitative. All dissolved lead results should be considered quantitative and all total lead results should be considered semi-quantitative.

The selenium spike recoveries for samples MQO563, 579, and 580 were outside DQO with recoveries of 57, 36, and 46 percent, respectively. There is no apparent reason for these unacceptable recoveries. All dissolved selenium results should be considered quantitative and, due to poor spike recoveries, all total selenium results should be considered qualitative.

All total and dissolved thallium results should be considered quantitative.

#### 1.4 ICP Metals

Two of the sampling blanks contained chromium contamination at concentrations greater than the CRDL. Equipment blank MQO559 contained 11 ug/L of dissolved chromium and trip blank MQO796 contained 25 ug/L of total chromium. The apparent chromium in the equipment blank may have been the result of a high bias noted in the chromium results on its analysis date (see the following comment). Due to the chromium contamination found in the trip blank, the total chromium results for samples MQO552, 554, 555, 561, 562, 563, 565, 566, 568, 575, and 576 should be considered unusable.

The low level (twice CRDL) linear range checks for chromium, copper, silver, and zinc had poor recoveries. 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 elements is not unexpected. Total chromium, silver, and zinc results for samples MQO553, 555, and 580 were affected and should be considered to be biased high. All dissolved copper, silver, and zinc results for all samples should be considered to be biased low and all dissolved chromium results should be considered to be biased high.

Individual spike recoveries were outside DQO for dissolved calcium in sample MQO563 (126 percent), dissolved silver in sample MQO580 (64 percent), and total

silver in samples MQO563 (332 percent) and 578 (332 percent). Low spike recoveries usually indicate results which are biased low and high spike recoveries usually indicate results which are biased high.

The ICP serial dilution results were not within 10 percent of the original determination for barium in sample MQO563 and for iron and magnesium in sample MQO580. Poor serial dilution results can be an indication of physical interferences in the analyses. At this facility, the interference is most prevalent in the leachate sample (MQO580) which contains high concentrations of dissolved solids. Such interferences usually yield results with a negative bias and thus a low recovery. Sample MQO563, however, did not contain high levels of dissolved solids and therefore the poor barium results cannot be attributed to physical interference.

Laboratory duplicate results for dissolved aluminum and iron and total chromium in sample MQO563 and aluminum in sample MQO580 were outside DQO.

Duplicate injection RSD results for calcium, iron, manganese, and zinc in samples MQO578 and 579 were all outside DQO.

All beryllium, cobalt, copper, manganese, nickel, potassium, sodium, vanadium, and zinc results should be considered quantitative. Aluminum, barium, calcium, chromium, iron, magnesium, and silver results, with exceptions listed below, should also be considered quantitative. The low level positive chromium results with exceptions, the medium level results for dissolved iron, magnesium, and silver, and the low level results for dissolved barium, calcium, and iron should be considered semi-quantitative. The medium level results for total aluminum, the low level results for dissolved aluminum, and the low level results for silver should be considered qualitative. Total chromium results for samples MQO552, 554, 555, 561, 562, 563, 565, 566, 568, 575, and 576 should be considered unreliable due to blank contamination at similar concentrations.

### 1.5 Mercury

No problems were detected with the mercury data. All mercury results should be considered quantitative with an acceptable probability of false negatives.

### 2.0 Inorganic and Indicator Analytes

#### 2.1 Performance Evaluation Standard

Inorganic and indicator analyte performance evaluation standards were not evaluated in conjunction with the samples collected from this facility.

#### 2.2 Inorganic and Indicator Analyte QC Evaluation

The average spike recoveries of all of the inorganic and indicator analytes, except for ammonia nitrogen in the leachate sample, were within the accuracy DQOs (accuracy DQOs have not been established for bromide and nitrite nitrogen matrix spikes). The ammonia nitrogen spike recovery was 114 percent in the leachate sample. The bromide and nitrite nitrogen spike recoveries were 92 and 100 percent in the ground-water samples and 98 and 94 percent in the leachate sample. The recoveries for all inorganic and indicator analytes are acceptable.

All LCS and CVS recoveries reported in the raw data for inorganic and indicator analytes were within Program DQOs.

Average RPDs for all inorganic and indicator analytes were within Program DQOs. Precision DQOs have not been established for bromide and nitrite nitrogen.

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. Contamination involving TOC, total phenols, bromide, and chloride was found in the both field blanks and the trip blank at levels above CRDL. These contaminants and their concentrations are listed below, as well as in Section 3.2.4 (page 3-3) of Reference 2.

### 2.3 Inorganic and Indicator Analyte Data

The QC standards for cyanide were not analyzed in conjunction with the sample analyses but were run three days earlier. All cyanide results should be considered qualitative with an acceptable probability of false negatives.

Nitrate nitrogen was detected in the trip blank (MQO796) at 9 ug/L. As a HWGWTF convention, all results greater than ten times the highest sampling blank concentration or less than the detection limit are considered quantitative (unless there are other problems with the data). Results greater than five but less than ten times the highest concentration of sampling blank contamination are considered qualitative and all other data are considered unusable. Therefore, the nitrate nitrogen results for sample MQO569 should be considered qualitative. Other results are listed below. The holding times for the nitrate nitrogen analyses ranged from 2 to 6 days from receipt of samples most of which are longer than the recommended 48 hour holding time for unpreserved samples. The final calibration verification (a CCV) for nitrate nitrogen (120 percent) was above the DQO. The analytical instrument should have been recalibrated and the calibration reverified before proceeding with the sample analyses. Results for samples MQO565, 569, 575, 576, 577, 579, and 580 were affected and should be considered to be biased high. The field duplicate precision for one of the two duplicate pairs (MQO569/570) was poor (50 ug/L of nitrate nitrogen detected in one sample (the CRDL is 300 ug/L), 1110 ug/L detected in the other). The comparative precision of the field duplicate results is not used in the evaluation of sample results as it is not possible to determine the source of this imprecision. Field duplicate precision is reported for informational purposes only. All nitrate nitrogen results, with the exceptions of sample MQO569 mentioned above which should be considered qualitative and sample MQO579 (see sulfate or chloride comment on this sample) which should not be used, should be considered to be semi-quantitative.

The holding times for the nitrite nitrogen analyses ranged from 2 to 6 days from receipt of samples which is generally longer than the recommended 48 hour holding time for unpreserved samples. The laboratory did not analyze an initial calibration verification (ICV) at the beginning of the nitrite nitrogen ion chromatography analytical batch, as required. The nitrite nitrogen results should be considered to be semi-quantitative except for sample MQO579 which should not be used (see sulfate or chloride comment on this sample).

The final CCV for chloride (336 percent) was above the DQO. The analytical instrument should have been recalibrated and the calibration reverified before proceeding with the sample analyses. Results for samples MQO565, 569, 575, 576, 577, 579, and 580 were affected and should be considered to be biased high. The chloride field duplicate precision for both of the duplicate pairs (MQO569/570 and MQO578/579) was poor (280,000 versus 190,000 ug/L in the first pair and 5900

versus no chloride detected in the other). These results were not used in the data usability determination as the results may only be a reflection of poor duplicate sampling techniques. Field duplicate precision is reported for informational purposes only. In the case of the sample MQO579 from the second field duplicate pair, no ion chromatography (IC) analytes (nitrate and nitrite nitrogen, chloride, bromide, and sulfate) were detected although other inorganic and indicator elements were. As the IC analysis, for all five IC analytes, is performed on a sample from a separate sample bottle, this indicates that something was wrong with either the sampling or analysis of this IC sample. Chloride was detected in the trip blank at a concentration of 2200 ug/L. As a HWGWTF convention, all results greater than ten times the highest sampling blank concentration or less than the detection limit are considered quantitative (unless there are other problems with the data). Results greater than five but less than ten times the highest concentration of sampling blank contamination are considered qualitative and all other data are considered unusable. Therefore, chloride results for samples MQO553 should be considered qualitative and results for samples MQO554, 555, 556, 557, 558, 561, and 578 should be considered unusable. The chloride results for all other samples should be considered semi-quantitative with the exception of sample MQO579 which should not be used because of the above mentioned problem with that sample.

The laboratory did not analyze an ICV at the beginning of the bromide ion chromatography analytical batch, as required. Bromide was detected in the trip blank at a concentration of 60 ug/L. As a HWGWTF convention, all results greater than ten times the highest sampling blank concentration or less than the detection limit are considered quantitative (unless there are other problems with the data). Results greater than five but less than ten times the highest concentration of sampling blank contamination are considered qualitative and all other data are considered unusable. Bromide results for samples MQO553, 562, 578, and 579 should not be used. The bromide results for sample MQO567 should be considered qualitative. All other bromide results should be considered to be semi-quantitative.

The final CCV for sulfate (260 percent) was above the DQO. The instrument should have been recalibrated and the calibration reverified before proceeding with the sample analyses. Results for samples MQO565, 569, 575, 576, 577, 579, and 580 were affected and should be considered to be biased high as a result. The sulfate field duplicate precision for both of the duplicate pairs (MQO569/570 and MQO578/579) was poor (140,000 versus 105,000 ug/L in the first pair and 180,000 versus no sulfate detected in the other). These results were not used in the data usability determination as the results may only be a reflection of poor duplicate sampling techniques. In the case of the sample MQO579 from the second field duplicate pair, no ion chromatography (IC) analytes, including sulfate, were detected although other inorganic and indicator elements were. As the IC analysis, for all five IC analytes, is performed on a sample from a separate sample bottle, this indicates that something was wrong with either the sampling or analysis of this IC sample. The sulfate results, as mentioned above, should be considered quantitative with the exceptions of samples MQO565, 569, 575, 576, 577, and 580 which should be considered semi-quantitative and sample MQO579 which should not be used.

One of two ammonia nitrogen ICVs and two CCVs were outside of DQO. The ammonia nitrogen field duplicate precision for one of the duplicate pairs (MQO569/570) was poor (35,000 versus 27,000 ug/L). These results were not used in the data usability determination as the results may only be a reflection of poor duplicate sampling techniques. All ammonia nitrogen results should be considered semi-quantitative.

Total phenol contamination was found in one of the field blanks (MQO577) and the trip blank (MQO796) at concentrations of 20 and 96 ug/L. These values are above the total phenol CRDL of 10 ug/L. Based upon HWGWTF conventions, all total phenols results greater than 10 times the highest concentration of total phenols in the sampling blanks or less than the detection limit are considered quantitative. This includes samples MQO554, 555, 557, 558, 559, and 560. All total phenols results greater than five but less than ten times the highest concentration of sampling blank contamination are considered qualitative and all other data are considered unusable. Total phenols results for all other samples (than the six mentioned above) should not be used.

One of two field blanks (MQO560) contained TOC at a concentration of 1200 ug/L which is above the CRDL of 1000 ug/L. Again, as a HWGWTF convention, all TOC results greater than ten times the highest field blank concentration or less than the detection limit should be considered quantitative. TOC results for samples MQO553, 559, 563, 568, 569, 570, 577, 580, and 796 should be, therefore, considered quantitative. All TOC results greater than five but less than ten times the highest concentration of sampling blank contamination are considered qualitative and all other data are considered unusable. The TOC results for samples MQO557, 561, 562, 565, and 576 should be considered qualitative, and all other TOC should not be used.

ICV and CCV standards for POC were not analyzed. A POC spike solution was run twice 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. One of two sets of field duplicates (MQO569/570) showed poor precision with POC concentrations of no POC reported and 380 ug/L. The comparative precision of the field duplicate results is not used in the evaluation of sample data as it is not possible to determine the source of this imprecision. Field duplicate precision is reported for informational purposes only. The POC results should be considered qualitative.

The TOX analysis was run over a period of five days. Final CCVs and final CCBs were not run at the end of each day's analytical batch. From the information on the laboratory work sheets it was not clear whether an ICV and a ICB were run at the beginning of one of the five day's analytical batches. Sample MQO580, the leachate sample, contained a high concentration of chloride (690,000 ug/L) which may have enhanced the TOX results for this sample. The results of one pair of field duplicates (MQO569/570) showed poor precision with TOX concentrations of 54 and 71 ug/L. The comparative precision of the field duplicate results is not used in the evaluation of sample data as it is not possible to determine the source of this imprecision. Field duplicate precision is reported for informational purposes only. The TOX results should be considered quantitative except for the samples where insufficient calibrations were performed. Samples with insufficient calibrations include MQO552, 554, 556, 557, 560, 563, 568, 577, and 579 and results for these samples should be considered semi-quantitative.

One of the two sets of POX field duplicates (MQO569/570) showed poor precision with no POX detected in one sample and 15 ug/L detected in the other. The comparative precision of the field duplicate results is not used in the evaluation of sample data as it is not possible to determine the source of this imprecision. Field duplicate precision is reported for informational purposes only. The holding times for samples MQO553 and 554 was eight days which exceeded the recommended holding time of seven days. POX results should be considered quantitative except for samples MQO553 and 554 which should be considered semi-quantitative.



### **3.0 Organics and Pesticides**

#### **3.1 Performance Evaluation Standard**

Organic performance evaluation standards were not evaluated in conjunction with the samples collected from this facility.

#### **3.2 Organic QC Evaluation**

All matrix spike average recoveries were within established Program DQOs for accuracy. Individual matrix spike recoveries which were outside the accuracy DQO will be discussed in the appropriate Sections below. All surrogate spike average recoveries were within DQOs for accuracy with two exceptions. Surrogate spike recoveries which were outside the accuracy DQO will be discussed in the appropriate Sections below.

All 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.

All organic analyses were performed as requested.

Laboratory blank contamination was reported for organics and is discussed in Reference 3 (for organics) as well as the appropriate Sections below.

Detection limits for the organic fractions are summarized in Reference 3 (for organics) as well as the appropriate Sections below.

#### **3.3 Volatiles**

Quality control data indicate that volatile organics were determined acceptably. The chromatograms appear acceptable. Initial and continuing calibrations, tunings and mass calibrations, blanks, matrix spikes and matrix spike duplicates, and surrogate spikes are acceptable.

Estimated method detection limits were CRDL for all samples except QO580, the leachate sample, which was 15 times CRDL. Dilution of this sample was required.

Laboratory blank #860809, analyzed on 8/9/86, was analyzed prior to the continuing calibration standard. This did not affect the results of the data evaluation.

The volatiles data are acceptable. The volatile compound results should be considered quantitative with the exception of the leachate sample (QO580) which should be considered semi-quantitative due to an increased probability of false negative results. The probability of false negative results for all other samples is acceptable.

#### **3.4 Semivolatiles**

Initial and continuing calibrations, tuning and mass calibrations, blanks, holding times, and chromatograms were acceptable for the semivolatiles. Some problems were encountered with matrix spike/matrix spike duplicate recoveries and surrogate recoveries.

Contamination was detected in three laboratory blanks (GH09623A21, GH095850C21, and GH095523C21). The blanks contained di-n-butylphthalate at less than the CRDL.

The matrix spike duplicate (MSD) recovery of 4-nitrophenol (9 percent) in sample QO578 was below the DQO of 10 to 80 percent. The relative percent differences (RPDs) between matrix spike and MSD recovery of 4-nitrophenol in sample QO578 and phenol in sample QO563 were above DQO.

The surrogate percent recoveries for phenol, 2-fluorophenol, and 2,4,6-tribromophenol in sample QO562 (no recovery for any of the three acids) and for phenol and 2-fluorophenol in sample QO562RE (reextracted sample, 8 and 6 percent recoveries) were below their respective DQOs.

The semivolatile data are acceptable and the results should be considered quantitative for all samples except QO580 which should be considered semi-quantitative due to increased probabilities of false negatives and for the acid fraction results for sample QO563 which should be considered unreliable due to poor acid recovery. Estimated method detection limits are twice CRDL for all samples except QO580 which is 10 times CRDL. The probability of false negatives is acceptable for all samples with the exception of QO580 due to raised detection limits caused by dilution where the probability of false negatives is increased.

### 3.5 Pesticides

The initial and continuing calibrations, blanks, matrix spike/matrix spike duplicates, surrogate spikes, and holding times for pesticides were acceptable. Some of the pesticide chromatograms appear to contain non-pesticide or unidentified peaks.

The estimated method detection limits for the pesticides fraction were CRDL for all samples. The pesticides results should be considered qualitative. There is an enhanced probability of false negatives (unrecovered pesticides in the sample) based upon the clean-up method used by the laboratory.

## III. Data Usability Summary

### 4.0 Graphite Furnace Metals

Quantitative:	all total and dissolved antimony, cadmium, and thallium results; all dissolved lead, selenium, and arsenic (except MQO570) results
Semi-quantitative:	all total arsenic and lead results
Qualitative:	all total selenium results
Unreliable:	dissolved arsenic results for sample MQO570

### 4.1 ICP Metals

Quantitative:	all beryllium, cobalt, copper, manganese, nickel, potassium, sodium, vanadium, and zinc results; aluminum, barium, calcium, chromium, iron, magnesium, and silver results with exceptions listed below
Semi-quantitative:	dissolved iron, magnesium, and silver results for sample MQO580 (leachate sample); all dissolved barium, calcium, and iron results except for sample MQO580; total chromium results with exceptions listed below

**Qualitative:** total silver results except for sample MQO580; total aluminum results for sample MQO580; dissolved aluminum results for all samples except MQO580  
**Unreliable:** total chromium results for samples MQO552, 554, 561, 562, 565, 563, 566, 568, 575, and 576

#### **4.2 Mercury**

**Quantitative:** all mercury results

#### **4.3 Inorganic and Indicator Analytes**

**Quantitative:** sulfate, TOX, and POX results with exceptions; total phenols results for samples MQO554, 555, 557, 558, 559, and 560; TOC results for samples MQO553, 559, 563, 568, 569, 570, 577, 580, and 796

**Semi-quantitative:** all ammonia nitrogen results; bromide, chloride, nitrate nitrogen, and nitrite nitrogen results with exceptions; sulfate results for samples MQO565, 569, 575, 576, 577, 579, and 580; TOX results for samples MQO552, 554, 556, 557, 560, 563, 568, 577, and 579; POX results for samples MQO553 and 554

**Qualitative:** all POC results; chloride results for sample MQO553; nitrate nitrogen results for sample MQO569; bromide results for sample MQO567; TOC results for samples MQO557, 561, 562, 565, and 576

**Unreliable:** all cyanide results

**Unusable:** all ion chromatography (nitrate and nitrite nitrogen, chloride, bromide, and sulfate) results for sample MQO579; chloride results for samples MQO554, 555, 556, 557, 558, 561, and 578; bromide results for samples MQO553, 562, and 578; total phenols and TOC results with exceptions

#### **4.4 Organics**

**Quantitative:** all volatiles results except sample QO580; all semivolatile results except sample QO580 and the acid fraction of sample QO563

**Semi-quantitative:** volatile and semivolatile results for sample QO580

**Qualitative:** all pesticides results

**Unreliable:** semivolatile acid fraction results for sample QO563

### **IV. References**

#### **1. Organic Analyses:**

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

**Inorganic and Indicator Analyses:**

**Centec Laboratories  
P.O. Box 956  
2160 Industrial Drive  
Salem, VA 24153  
(703) 387-3995**

- 2. Draft Quality Control Data Evaluation Report (Assessment of the Usability of the Data Generated) for site 41B, Land Reclamation, Wisconsin, 11/4/1986, Prepared by Lockheed Engineering and Management Services Company, Inc., for the US EPA Hazardous Waste Ground-Water Task Force.**
- 3. Draft Inorganic Data Usability Audit Report and Draft Organic Data Usability Report, for the Land Reclamation, Wisconsin site, Prepared by Laboratory Performance Monitoring Group, Lockheed Engineering and Management Services Co., Las Vegas, Nevada, for US EPA, EMSL/Las Vegas, 11/4/1986.**

**V. Addressees**

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December 18, 1986

Mr. Anthony Montrone  
Hazardous Waste Ground-Water  
Task Force (WH-562A)  
U.S. EPA  
401 M Street, S.W., Room S-301  
Washington, D.C. 20460

Dear Mr. Montrone:

PRC Environmental Management, Inc. are pleased to submit for your review the final memorandum for QA/QC support of Work Assignment No. 548 entitled "Evaluation of Quality Control Attendant to the Analysis of Samples from the Land Reclamation, Wisconsin Facility."

If you have any questions regarding this submittal, please feel free to contact us.

Sincerely,

PRC Environmental Management, Inc.

*Stanley Jabrudi*

for Daniel T. Chow

DTC/cvh

cc: Nancy Deck (w/1 copy of report)  
Bruce Bakaysa (letter only)  
Barbara Elkus (w/1 copy of report)  
Rich Steimle (w/1 copy of report)  
Paul Friedman (w/1 copy of report)  
Ken Partymiller (w/copy of report)  
Brian Lewis (w/1 copy of report)  
Gareth Pearson (w/1 copy of report)  
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## **ENFORCEMENT CONFIDENTIAL**

### **EVALUATION OF QUALITY CONTROL ATTENDANT TO THE ANALYSIS OF SAMPLES FROM THE LAND RECLAMATION, WISCONSIN FACILITY**

#### **FINAL MEMORANDUM**

**Prepared for**

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
Office of Waste Programs Enforcement  
Washington, D.C. 20460**

Work Assignment No. :	548
EPA Region :	Headquarters
Site No. :	N/A
Date Prepared :	December 18, 1986
Contract No. :	68-01-7037
PRC No. :	15-5480-05
Prepared By :	PRC Environmental Management, Inc. (Ken Partymiller)
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**PRIVILEGED WORK PRODUCT PREPARED  
IN ANTICIPATION OF LITIGATION**



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**MEMORANDUM**

**DATE:** December 17, 1986

**SUBJECT:** Evaluation of Quality Control Attendant to the Analysis of Samples from the Land Reclamation, Wisconsin Facility

**FROM:** Ken Partymiller, Chemist  
PRC Environmental Management

**THRU:** Paul H. Friedman, Chemist\*  
Studies and Methods Branch (WH-562B)

**TO:** HWGWTF: Tony Montrone\*  
Gareth Pearson (EPA 8231)\*  
Richard Steimle\*  
Ed Berg (EPA 8214)\*  
James Adams, Jr., Region V  
John McGuire, Region V  
Brian Lewis

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 Land Reclamation, Wisconsin 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 (2-3) 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 presents 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

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\* HWGWTF Data Evaluation Committee Member



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 accompanying reports (2-3). 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.

## **I. Site Overview**

The Land Reclamation facility is located in Racine, Wisconsin. The landfill is on an eighty-one acre site and has been in operation since 1970. The landfill is situated on a glacial ridge which consists of silty-clay loam containing little sand or gravel so contaminant migration is expected to be slow. Hazardous wastes were accepted at the facility until 1982. Types of hazardous wastes accepted, according to the facility's Part A Permit Application, include ignitable wastes, metals, spent halogenated solvents, non-halogenated solvents, electroplating wastes, pickle liquors, ethylhexylphthalate, tetrachloroethylene, and trichloroethane. The facility is in Detection Monitoring which means that there has been no indication of leakage from the site according to the data submitted by the facility. Some violations of Interim Status standards have occurred including problems with the adequacy of the ground-water monitoring system and several of the Federal Facility Standards.

An old city landfill is located next to the hazardous waste site. This unlined landfill may have accepted hazardous wastes. Contamination from this site may be impacting some of the Land Reclamation wells as contamination has been seen previously at some of the wells located between the two sites. Some of the Land Reclamation up-gradient wells have shown possible contamination and may not be true "up-gradient" wells.

Twenty-five field samples including two field blanks (MQO560/QO560 and MQO577/QO577), one equipment blank (MQO559/QO559), one trip blank (MQO796/QO796), and two pairs of duplicate samples (well 40U, MQO569/QO569 and MQO570/QO570 and well 40L, MQO578/QO578 and MQO579/QO579) were collected at this facility. Sample MQO580/QO580 is a medium concentration leachate sample. Sample MQO576/QO576 is a low concentration surface water sample. All other samples were low concentration ground-water samples.

## **II. Evaluation of Quality Control Data and Analytical Data**

### **1.0 Metals**

#### **1.1 Performance Evaluation Standards**

Metal analyte performance evaluation standards were not evaluated in conjunction with the samples collected from this facility.

## **1.2 Metals OC Evaluation**

Total and dissolved metal spike recoveries were calculated for twenty-three metals spiked into six low concentration ground-water samples (MQO558, 563, 569, 570, 578, and 579) and one medium concentration leachate sample (MQO580). Not all metals were spiked into each of these samples and separate samples were spiked for the total and dissolved metal ground-water samples. Nineteen of the twenty-three total metal average spike recoveries and all seventeen of the dissolved metal average spike recoveries from the low concentration ground-water samples were within the data quality objectives (DQOs) for this Program. In the low concentration ground-water samples, the total selenium and silver average spike recoveries were outside DQO with values of 47 and 332 percent, respectively. The total aluminum and iron spike recoveries were not calculated as the sample concentrations of these metals were greater than four times the concentration of the spike. Various individual metal spike recoveries from the ground-water samples were also outside DQO. These are listed in Table 3-2a of Reference 2 as well as in the following Sections. A listing of which samples were spiked for each analyte is also available in Table 3-2a of Reference 2.

Nineteen of the twenty-three total metal spike recoveries and twelve of the seventeen dissolved metal spike recoveries from the medium concentration leachate spiked sample (only the single sample was spiked) were within DQO. In the leachate sample the total selenium and dissolved silver spike recoveries were outside DQO with values of 46 and 64 percent. The total aluminum, iron, and lead, and dissolved iron, magnesium, potassium, and sodium spike recoveries were not calculated because the sample concentrations of these metals were greater than four times the concentration of the spike.

All reported laboratory control sample (LCS) recoveries and all calibration verification standard (CVS) recoveries were within Program DQOs.

The calculable average relative percent differences (RPDs) for metallic analytes in ground-water samples, except total chromium and lead and dissolved aluminum and iron, were within Program DQOs. The calculable RPDs for all metallic analytes in the leachate sample, except total aluminum, were within the DQOs. RPDs were not calculated for about one-half of the metal analytes because the concentrations of many of the metals in the field samples used for the RPD determination were less than the CRDL.

Required analyses were performed on all metals samples submitted to the laboratory.

No contamination was reported in the laboratory blanks. A trip blank (MQO796) contained 25 ug/L of total chromium and an equipment blank (MQO559) contained 11 ug/L of dissolved chromium. Both of these values are above the CRDL.

## **1.3 Furnace Metals**

The graphite furnace metals (antimony, arsenic, cadmium, lead, selenium, and thallium) quality control, with exceptions, was acceptable.

Duplicate injection precision for antimony was poor for samples MQO558, 578, 579, and 580Dup (the duplicate leachate analysis). All total and dissolved antimony results should be considered quantitative.

The total arsenic spike recovery for sample MQO563 was outside DQO with a recovery of 66 percent. The method of standard addition (MSA) correlation coefficient for dissolved arsenic in sample MQO570 was outside control limits. There was suspected interference in this analysis due to the presence of large concentrations of sulfate. Dissolved arsenic results for this sample (MQO570) should not be used. All dissolved arsenic results, with the exception of sample MQO570, should be considered quantitative. Due to variable total arsenic spike recoveries, all total arsenic results should be considered semi-quantitative.

The cadmium results, recorded on Form 3, for three continuing calibration blanks (CCBs) were slightly different than the values reported in the raw data. This has no impact on data quality. All cadmium results should be considered quantitative.

The correlation coefficient for the MSA analysis of total lead in sample MQO580Dup was outside of DQO. Laboratory duplicate RPDs or absolute differences for total lead in samples MQO563 and 578 were outside DQO. The duplicate injection relative standard difference (RSD) for dissolved lead in sample MQO563Dup was outside DQO. There were deviations in the control limits for one set of continuing calibration verifications (CCVs) and CCBs for the lead analysis. Samples MQO560, 561, 563, 566, and 568 were run after the unacceptable CCV and CCB and total lead results for these samples should be considered semi-quantitative. All dissolved lead results should be considered quantitative and all total lead results should be considered semi-quantitative.

The selenium spike recoveries for samples MQO563, 579, and 580 were outside DQO with recoveries of 57, 36, and 46 percent, respectively. There is no apparent reason for these unacceptable recoveries. All dissolved selenium results should be considered quantitative and, due to poor spike recoveries, all total selenium results should be considered qualitative.

All total and dissolved thallium results should be considered quantitative.

#### 1.4 ICP Metals

Two of the sampling blanks contained chromium contamination at concentrations greater than the CRDL. Equipment blank MQO559 contained 11 ug/L of dissolved chromium and trip blank MQO796 contained 25 ug/L of total chromium. The apparent chromium in the equipment blank may have been the result of a high bias noted in the chromium results on its analysis date (see the following comment). Due to the chromium contamination found in the trip blank, the total chromium results for samples MQO552, 554, 555, 561, 562, 563, 565, 566, 568, 575, and 576 should be considered unusable.

The low level (twice CRDL) linear range checks for chromium, copper, silver, and zinc had poor recoveries. 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 elements is not unexpected. Total chromium, silver, and zinc results for samples MQO553, 555, and 580 were affected and should be considered to be biased high. All dissolved copper, silver, and zinc results for all samples should be considered to be biased low and all dissolved chromium results should be considered to be biased high.

Individual spike recoveries were outside DQO for dissolved calcium in sample MQO563 (126 percent), dissolved silver in sample MQO580 (64 percent), and total

silver in samples MQO563 (332 percent) and 578 (332 percent). Low spike recoveries usually indicate results which are biased low and high spike recoveries usually indicate results which are biased high.

The ICP serial dilution results were not within 10 percent of the original determination for barium in sample MQO563 and for iron and magnesium in sample MQO580. Poor serial dilution results can be an indication of physical interferences in the analyses. At this facility, the interference is most prevalent in the leachate sample (MQO580) which contains high concentrations of dissolved solids. Such interferences usually yield results with a negative bias and thus a low recovery. Sample MQO563, however, did not contain high levels of dissolved solids and therefore the poor barium results cannot be attributed to physical interference.

Laboratory duplicate results for dissolved aluminum and iron and total chromium in sample MQO563 and aluminum in sample MQO580 were outside DQO.

Duplicate injection RSD results for calcium, iron, manganese, and zinc in samples MQO578 and 579 were all outside DQO.

All beryllium, cobalt, copper, manganese, nickel, potassium, sodium, vanadium, and zinc results should be considered quantitative. Aluminum, barium, calcium, chromium, iron, magnesium, and silver results, with exceptions listed below, should also be considered quantitative. The low level positive chromium results with exceptions, the medium level results for dissolved iron, magnesium, and silver, and the low level results for dissolved barium, calcium, and iron should be considered semi-quantitative. The medium level results for total aluminum, the low level results for dissolved aluminum, and the low level results for silver should be considered qualitative. Total chromium results for samples MQO552, 554, 555, 561, 562, 563, 565, 566, 568, 575, and 576 should be considered unreliable due to blank contamination at similar concentrations.

## 1.5 Mercury

No problems were detected with the mercury data. All mercury results should be considered quantitative with an acceptable probability of false negatives.

## 2.0 Inorganic and Indicator Analytes

### 2.1 Performance Evaluation Standard

Inorganic and indicator analyte performance evaluation standards were not evaluated in conjunction with the samples collected from this facility.

### 2.2 Inorganic and Indicator Analyte OC Evaluation

The average spike recoveries of all of the inorganic and indicator analytes, except for ammonia nitrogen in the leachate sample, were within the accuracy DQOs (accuracy DQOs have not been established for bromide and nitrite nitrogen matrix spikes). The ammonia nitrogen spike recovery was 114 percent in the leachate sample. The bromide and nitrite nitrogen spike recoveries were 92 and 100 percent in the ground-water samples and 98 and 94 percent in the leachate sample. The recoveries for all inorganic and indicator analytes are acceptable.

All LCS and CVS recoveries reported in the raw data for inorganic and indicator analytes were within Program DQOs.

Average RPDs for all inorganic and indicator analytes were within Program DQOs. Precision DQOs have not been established for bromide and nitrite nitrogen.

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. Contamination involving TOC, total phenols, bromide, and chloride was found in the both field blanks and the trip blank at levels above CRDL. These contaminants and their concentrations are listed below, as well as in Section 3.2.4 (page 3-3) of Reference 2.

### 2.3 Inorganic and Indicator Analyte Data

The QC standards for cyanide were not analyzed in conjunction with the sample analyses but were run three days earlier. All cyanide results should be considered qualitative with an acceptable probability of false negatives.

Nitrate nitrogen was detected in the trip blank (MQO796) at 9 ug/L. As a HWGWTF convention, all results greater than ten times the highest sampling blank concentration or less than the detection limit are considered quantitative (unless there are other problems with the data). Results greater than five but less than ten times the highest concentration of sampling blank contamination are considered qualitative and all other data are considered unusable. Therefore, the nitrate nitrogen results for sample MQO569 should be considered qualitative. Other results are listed below. The holding times for the nitrate nitrogen analyses ranged from 2 to 6 days from receipt of samples most of which are longer than the recommended 48 hour holding time for unpreserved samples. The final calibration verification (a CCV) for nitrate nitrogen (120 percent) was above the DQO. The analytical instrument should have been recalibrated and the calibration reverified before proceeding with the sample analyses. Results for samples MQO565, 569, 575, 576, 577, 579, and 580 were affected and should be considered to be biased high. The field duplicate precision for one of the two duplicate pairs (MQO569/570) was poor (50 ug/L of nitrate nitrogen detected in one sample (the CRDL is 300 ug/L), 1110 ug/L detected in the other). The comparative precision of the field duplicate results is not used in the evaluation of sample results as it is not possible to determine the source of this imprecision. Field duplicate precision is reported for informational purposes only. All nitrate nitrogen results, with the exceptions of sample MQO569 mentioned above which should be considered qualitative and sample MQO579 (see sulfate or chloride comment on this sample) which should not be used, should be considered to be semi-quantitative.

The holding times for the nitrite nitrogen analyses ranged from 2 to 6 days from receipt of samples which is generally longer than the recommended 48 hour holding time for unpreserved samples. The laboratory did not analyze an initial calibration verification (ICV) at the beginning of the nitrite nitrogen ion chromatography analytical batch, as required. The nitrite nitrogen results should be considered to be semi-quantitative except for sample MQO579 which should not be used (see sulfate or chloride comment on this sample).

The final CCV for chloride (336 percent) was above the DQO. The analytical instrument should have been recalibrated and the calibration reverified before proceeding with the sample analyses. Results for samples MQO565, 569, 575, 576, 577, 579, and 580 were affected and should be considered to be biased high. The chloride field duplicate precision for both of the duplicate pairs (MQO569/570 and MQO578/579) was poor (280,000 versus 190,000 ug/L in the first pair and 5900

versus no chloride detected in the other). These results were not used in the data usability determination as the results may only be a reflection of poor duplicate sampling techniques. Field duplicate precision is reported for informational purposes only. In the case of the sample MQO579 from the second field duplicate pair, no ion chromatography (IC) analytes (nitrate and nitrite nitrogen, chloride, bromide, and sulfate) were detected although other inorganic and indicator elements were. As the IC analysis, for all five IC analytes, is performed on a sample from a separate sample bottle, this indicates that something was wrong with either the sampling or analysis of this IC sample. Chloride was detected in the trip blank at a concentration of 2200 ug/L. As a HWGWTF convention, all results greater than ten times the highest sampling blank concentration or less than the detection limit are considered quantitative (unless there are other problems with the data). Results greater than five but less than ten times the highest concentration of sampling blank contamination are considered qualitative and all other data are considered unusable. Therefore, chloride results for samples MQO553 should be considered qualitative and results for samples MQO554, 555, 556, 557, 558, 561, and 578 should be considered unusable. The chloride results for all other samples should be considered semi-quantitative with the exception of sample MQO579 which should not be used because of the above mentioned problem with that sample.

The laboratory did not analyze an ICV at the beginning of the bromide ion chromatography analytical batch, as required. Bromide was detected in the trip blank at a concentration of 60 ug/L. As a HWGWTF convention, all results greater than ten times the highest sampling blank concentration or less than the detection limit are considered quantitative (unless there are other problems with the data). Results greater than five but less than ten times the highest concentration of sampling blank contamination are considered qualitative and all other data are considered unusable. Bromide results for samples MQO553, 562, 578, and 579 should not be used. The bromide results for sample MQO567 should be considered qualitative. All other bromide results should be considered to be semi-quantitative.

The final CCV for sulfate (260 percent) was above the DQO. The instrument should have been recalibrated and the calibration reverified before proceeding with the sample analyses. Results for samples MQO565, 569, 575, 576, 577, 579, and 580 were affected and should be considered to be biased high as a result. The sulfate field duplicate precision for both of the duplicate pairs (MQO569/570 and MQO578/579) was poor (140,000 versus 105,000 ug/L in the first pair and 180,000 versus no sulfate detected in the other). These results were not used in the data usability determination as the results may only be a reflection of poor duplicate sampling techniques. In the case of the sample MQO579 from the second field duplicate pair, no ion chromatography (IC) analytes, including sulfate, were detected although other inorganic and indicator elements were. As the IC analysis, for all five IC analytes, is performed on a sample from a separate sample bottle, this indicates that something was wrong with either the sampling or analysis of this IC sample. The sulfate results, as mentioned above, should be considered quantitative with the exceptions of samples MQO565, 569, 575, 576, 577, and 580 which should be considered semi-quantitative and sample MQO579 which should not be used.

One of two ammonia nitrogen ICVs and two CCVs were outside of DQO. The ammonia nitrogen field duplicate precision for one of the duplicate pairs (MQO569/570) was poor (35,000 versus 27,000 ug/L). These results were not used in the data usability determination as the results may only be a reflection of poor duplicate sampling techniques. All ammonia nitrogen results should be considered semi-quantitative.

Total phenol contamination was found in one of the field blanks (MQO577) and the trip blank (MQO796) at concentrations of 20 and 96 ug/L. These values are above the total phenol CRDL of 10 ug/L. Based upon HWGWTF conventions, all total phenols results greater than 10 times the highest concentration of total phenols in the sampling blanks or less than the detection limit are considered quantitative. This includes samples MQO554, 555, 557, 558, 559, and 560. All total phenols results greater than five but less than ten times the highest concentration of sampling blank contamination are considered qualitative and all other data are considered unusable. Total phenols results for all other samples (than the six mentioned above) should not be used.

One of two field blanks (MQO560) contained TOC at a concentration of 1200 ug/L which is above the CRDL of 1000 ug/L. Again, as a HWGWTF convention, all TOC results greater than ten times the highest field blank concentration or less than the detection limit should be considered quantitative. TOC results for samples MQO553, 559, 563, 568, 569, 570, 577, 580, and 796 should be, therefore, considered quantitative. All TOC results greater than five but less than ten times the highest concentration of sampling blank contamination are considered qualitative and all other data are considered unusable. The TOC results for samples MQO557, 561, 562, 565, and 576 should be considered qualitative, and all other TOC should not be used.

ICV and CCV standards for POC were not analyzed. A POC spike solution was run twice 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. One of two sets of field duplicates (MQO569/570) showed poor precision with POC concentrations of no POC reported and 380 ug/L. The comparative precision of the field duplicate results is not used in the evaluation of sample data as it is not possible to determine the source of this imprecision. Field duplicate precision is reported for informational purposes only. The POC results should be considered qualitative.

The TOX analysis was run over a period of five days. Final CCVs and final CCBs were not run at the end of each days' analytical batch. From the information on the laboratory work sheets it was not clear whether an ICV and a ICB were run at the beginning of one of the five day's analytical batches. Sample MQO580, the leachate sample, contained a high concentration of chloride (690,000 ug/L) which may have enhanced the TOX results for this sample. The results of one pair of field duplicates (MQO569/570) showed poor precision with TOX concentrations of 54 and 71 ug/L. The comparative precision of the field duplicate results is not used in the evaluation of sample data as it is not possible to determine the source of this imprecision. Field duplicate precision is reported for informational purposes only. The TOX results should be considered quantitative except for the samples where insufficient calibrations were performed. Samples with insufficient calibrations include MQO552, 554, 556, 557, 560, 563, 568, 577, and 579 and results for these samples should be considered semi-quantitative.

One of the two sets of POX field duplicates (MQO569/570) showed poor precision with no POX detected in one sample and 15 ug/L detected in the other. The comparative precision of the field duplicate results is not used in the evaluation of sample data as it is not possible to determine the source of this imprecision. Field duplicate precision is reported for informational purposes only. The holding times for samples MQO553 and 554 was eight days which exceeded the recommended holding time of seven days. POX results should be considered quantitative except for samples MQO553 and 554 which should be considered semi-quantitative.

### 3.0 Organics and Pesticides

#### 3.1 Performance Evaluation Standard

Organic performance evaluation standards were not evaluated in conjunction with the samples collected from this facility.

#### 3.2 Organic QC Evaluation

All matrix spike average recoveries were within established Program DQOs for accuracy. Individual matrix spike recoveries which were outside the accuracy DQO will be discussed in the appropriate Sections below. All surrogate spike average recoveries were within DQOs for accuracy with two exceptions. Surrogate spike recoveries which were outside the accuracy DQO will be discussed in the appropriate Sections below.

All 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.

All organic analyses were performed as requested.

Laboratory blank contamination was reported for organics and is discussed in Reference 3 (for organics) as well as the appropriate Sections below.

Detection limits for the organic fractions are summarized in Reference 3 (for organics) as well as the appropriate Sections below.

#### 3.3 Volatiles

Quality control data indicate that volatile organics were determined acceptably. The chromatograms appear acceptable. Initial and continuing calibrations, tunings and mass calibrations, blanks, matrix spikes and matrix spike duplicates, and surrogate spikes are acceptable.

Estimated method detection limits were CRDL for all samples except QO580, the leachate sample, which was 15 times CRDL. Dilution of this sample was required.

Laboratory blank #860809, analyzed on 8/9/86, was analyzed prior to the continuing calibration standard. This did not affect the results of the data evaluation.

The volatiles data are acceptable. The volatile compound results should be considered quantitative with the exception of the leachate sample (QO580) which should be considered semi-quantitative due to an increased probability of false negative results. The probability of false negative results for all other samples is acceptable.

#### 3.4 Semivolatiles

Initial and continuing calibrations, tuning and mass calibrations, blanks, holding times, and chromatograms were acceptable for the semivolatiles. Some problems were encountered with matrix spike/matrix spike duplicate recoveries and surrogate recoveries.



Contamination was detected in three laboratory blanks (GH09623A21, GH095850C21, and GH095523C21). The blanks contained di-n-butylphthalate at less than the CRDL.

The matrix spike duplicate (MSD) recovery of 4-nitrophenol (9- percent) in sample QO578 was below the DQO of 10 to 80 percent. The relative percent differences (RPDs) between matrix spike and MSD recovery of 4-nitrophenol in sample QO578 and phenol in sample QO563 were above DQO.

The surrogate percent recoveries for phenol, 2-fluorophenol, and 2,4,6-tribromophenol in sample QO562 (no recovery for any of the three acids) and for phenol and 2-fluorophenol in sample QO562RE (reextracted sample, 8 and 6 percent recoveries) were below their respective DQOs.

The semivolatile data are acceptable and the results should be considered quantitative for all samples except QO580 which should be considered semi-quantitative due to increased probabilities of false negatives and for the acid fraction results for sample QO563 which should be considered unreliable due to poor acid recovery. Estimated method detection limits are twice CRDL for all samples except QO580 which is 10 times CRDL. The probability of false negatives is acceptable for all samples with the exception of QO580 due to raised detection limits caused by dilution where the probability of false negatives is increased.

### 3.5 Pesticides

The initial and continuing calibrations, blanks, matrix spike/matrix spike duplicates, surrogate spikes, and holding times for pesticides were acceptable. Some of the pesticide chromatograms appear to contain non-pesticide or unidentified peaks.

The estimated method detection limits for the pesticides fraction were CRDL for all samples. The pesticides results should be considered qualitative. There is an enhanced probability of false negatives (unrecovered pesticides in the sample) based upon the clean-up method used by the laboratory.

## III. Data Usability Summary

### 4.0 Graphite Furnace Metals

Quantitative:	all total and dissolved antimony, cadmium, and thallium results; all dissolved lead, selenium, and arsenic (except MQO570) results
Semi-quantitative:	all total arsenic and lead results
Qualitative:	all total selenium results
Unreliable:	dissolved arsenic results for sample MQO570

### 4.1 ICP Metals

Quantitative:	all beryllium, cobalt, copper, manganese, nickel, potassium, sodium, vanadium, and zinc results; aluminum, barium, calcium, chromium, iron, magnesium, and silver results with exceptions listed below
Semi-quantitative:	dissolved iron, magnesium, and silver results for sample MQO580 (leachate sample); all dissolved barium, calcium, and iron results except for sample MQO580; total chromium results with exceptions listed below

**Qualitative:** total silver results except for sample MQO580; total aluminum results for sample MQO580; dissolved aluminum results for all samples except MQO580  
**Unreliable:** total chromium results for samples MQO552, 554, 561, 562, 565, 563, 566, 568, 575, and 576

#### 4.2 Mercury

**Quantitative:** all mercury results

#### 4.3 Inorganic and Indicator Analytes

**Quantitative:** sulfate, TOX, and POX results with exceptions; total phenols results for samples MQO554, 555, 557, 558, 559, and 560; TOC results for samples MQO553, 559, 563, 568, 569, 570, 577, 580, and 796  
**Semi-quantitative:** all ammonia nitrogen results; bromide, chloride, nitrate nitrogen, and nitrite nitrogen results with exceptions; sulfate results for samples MQO565, 569, 575, 576, 577, 579, and 580; TOX results for samples MQO552, 554, 556, 557, 560, 563, 568, 577, and 579; POX results for samples MQO553 and 554  
**Qualitative:** all POC results; chloride results for sample MQO553; nitrate nitrogen results for sample MQO569; bromide results for sample MQO567; TOC results for samples MQO557, 561, 562, 565, and 576  
**Unreliable:** all cyanide results  
**Unusable:** all ion chromatography (nitrate and nitrite nitrogen, chloride, bromide, and sulfate) results for sample MQO579; chloride results for samples MQO554, 555, 556, 557, 558, 561, and 578; bromide results for samples MQO553, 562, and 578; total phenols and TOC results with exceptions

#### 4.4 Organics

**Quantitative:** all volatiles results except sample QO580; all semivolatile results except sample QO580 and the acid fraction of sample QO563  
**Semi-quantitative:** volatile and semivolatile results for sample QO580  
**Qualitative:** all pesticides results  
**Unreliable:** semivolatile acid fraction results for sample QO563

### IV. References

#### 1. Organic Analyses:

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

**Inorganic and Indicator Analyses:**

**Centec Laboratories  
P.O. Box 956  
2160 Industrial Drive  
Salem, VA 24153  
(703) 387-3995**

2. **Draft Quality Control Data Evaluation Report (Assessment of the Usability of the Data Generated) for site 41B, Land Reclamation, Wisconsin, 11/4/1986, Prepared by Lockheed Engineering and Management Services Company, Inc., for the US EPA Hazardous Waste Ground-Water Task Force.**
3. **Draft Inorganic Data Usability Audit Report and Draft Organic Data Usability Report, for the Land Reclamation, Wisconsin site, Prepared by Laboratory Performance Monitoring Group, Lockheed Engineering and Management Services Co., Las Vegas, Nevada, for US EPA, EMSL/Las Vegas, 11/4/1986.**

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## **APPENDIX 1**

### **Contract Required Detection Limits and Instrument Detection Limits for Metals, Inorganic, and Indicator Parameters**

TABLE A1-1

CONTRACT REQUIRED DETECTION LIMITS AND INSTRUMENT  
DETECTION LIMITS FOR METALS, INORGANIC, AND INDICATOR PARAMETERS

Parameter	CRDL	IDL
<u>Metals</u>		
Aluminum	200	100
Antimony	60	3
Arsenic	10	6
Barium	200	4
Beryllium	5	4
Cadmium	5	0.5
Calcium	5000	93
Chromium	10	8
Cobalt	50	16
Copper	25	12
Iron	100	10
Lead	5	2
Magnesium	5000	238
Manganese	15	3
Mercury	0.2	0.2
Nickel	40	20
Potassium	5000	2160
Selenium	5	3
Silver	10	10
Sodium	5000	156
Thallium	10	5
Vanadium	50	21
Zinc	20	12
<u>Inorganic and Indicators</u>		
Ammonia nitrogen	100	100
Bromide		50
Chloride	1000	1000
Cyanide	10	
Nitrate nitrogen	300	300
Nitrite nitrogen		50
POC	10	100
POX	5	5
Sulfate	1000	500
TOC	1000	1000
TOX	5	5
Total Phenols	10	10

concentrations are in  $\mu\text{g/l}$

## APPENDIX 2

### SUMMARY OF CONCENTRATIONS FOR COMPOUNDS FOUND IN LOW LEVEL GROUND-WATER AND SAMPLING BLANK SAMPLES AT LAND RECLAMATION, WI

The following tables list 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.

Sample numbers are designated by the organic and corresponding inorganic sample number. Organic sample numbers are preceded by the prefix "Q;" inorganic sample numbers are preceded by the prefix "MQO."

## TABLE KEY

Value without a flag indicates a result above the contract required detection limit.

- 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  $\mu\text{g}$  and a concentration of 3  $\mu\text{g}$  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.



SITE: #41R LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:		Q0560/HQ0560	Q0577/HQ0577	Q0559/HQ0559	Q0796/HQ0796	Q0569/HQ0569
SAMPLE LOCATION:						WELL 40U
SAMPLE TYPE:		FIELD BLK	FIELD BLK	EQUIP. BLK	TRIP BLK	DUPLICATE
VOA	TOLUENE		1.7 J	1.7 J		
	ACETONE					
	METHYLENE CHLORIDE					
	2-BUTANONE					
	BENZENE					
	1,1-DICHLOROETHANE					
	1,1,1-TRICHLOROETHANE					
	TETRACHLOROETHENE					
	TRANS-1,2-DICHLOROETHENE					
	TRICHLOROETHENE					
	4-METHYL-2-PENTANONE					
	ETHYL BENZENE					
	XYLENES					
SEMI-VOA	PHENOL		2.2 J		7 J	
	BIS(2-ETHYLHEXYL)PHTHALATE					
	DIETHYLPHTHALATE					
	DI-N-BUTYL PHTHALATE				2.8 J	2.2 J
	2-METHYLPHENOL					
	4-METHYLPHENOL					
	2,4-DIMETHYLPHENOL					
	NAPHTHALENE					
PEST/PCB	DIELDRIN					
	4-4'-DDO					
TIC-VOA	TETRAHYDROFURAN					
	METHANE, TRICHLOROFLUORO					
	UNKNOWN					
TIC-SEMI-VOA	ETHANE, 1,1-OXYBIS					(PUR 962) 11J
	BENZENE, 1,2-DIMETHYL					
	BENZENE, 1,3-DIMETHYL					
	BENZENEACETIC ACID					
	PHENOL, TETRAMETHYLBUTYL					
	2-PROPANOL, METHOXY SUBSTITUTED					
	HEXANOIC ACID					
	HEXANOIC ACID, METHYL SUBST.					
	OCTANOIC ACID					
	BENZENEPROPANOIC ACID					
	UNKNOWN					25 J
	UNKNOWN					20 J
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					

ALL CONCENTRATIONS IN ug/L

SITE: #41R LAND RECLAMATION, WI

CASE NO: 6277-L-1944HQ

SAMPLE NO:		00560/H00560	00577/H00577	00559/H00559	00796/H00796	00569/H00569
SAMPLE LOCATION:						WELL 40U
SAMPLE TYPE:		FIELD BLK	FIELD BLK	EQUIP. BLK	TRIP BLK	DUPLICATE
UNKNOWN						
TOTAL METALS	ALUMINUM					30700
	ANTIMONY					
	ARSENIC					
	BARIUM					410
	BERYLLIUM					
	CADMIUM					
	CALCIUM	100	97	177	320	147000
	CHROMIUM				25	56
	COBALT					18
	COPPER					46
	IRON				26	36200
	LEAD					
	MAGNESIUM					96700
	MANGANESE					724
	MERCURY					
DIS METALS	NICKEL					52
	POTASSIUM					59300
	SELENIUM					
	SILVER					
	SODIUM	519	429	390	588	354000
	THALLIUM					
	VANADIUM					
	ZINC					57
						173
	ALUMINUM			119		
	ANTIMONY					
	ARSENIC					21
	BARIUM					92
	BERYLLIUM					
DIS METALS	CADMIUM					
	CALCIUM	110	144	135	308	101000
	CHROMIUM			11		18
	COBALT					
	COPPER					
	IRON					26
	LEAD					
	MAGNESIUM					72100
	MANGANESE					264
	MERCURY					
	NICKEL					
	POTASSIUM					56400
	SELENIUM					
	SILVER					

ALL CONCENTRATIONS IN ug/L

SITE: 041R LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	00560/000560	00577/000577	00559/000559	00796/000796	00569/000569
SAMPLE LOCATION:					WELL 40U
SAMPLE TYPE:	FIELD BLK	FIELD BLK	EQUIP. BLK	TRIP BLK	DUPLICATE
SODIUM	502	535	485	733	386000
THALLIUM					
VANADIUM					
ZINC					72
INDRG. AMMONIA NITROGEN					35000
INDIC. BROMIDE				60	4800
CHLORIDE				2200	280000
CYANIDE					
NITRATE NITROGEN				9	50
NITRITE NITROGEN					
POC					
POX					
SULFATE					140000
TOC	1200				41000
TOTAL PHENOLS		20		96	105
TOX					54
CARBONATE					
BICARBONATE					

ALL CONCENTRATIONS IN ug/L

CASE NO: 6277-L-1944HQ

SAMPLE NO:	00570/M00570	00578/M00578	00579/M00579	00552/M00522	00553/M00553
SAMPLE LOCATION:	WELL 40U	WELL 40L	WELL 40L	WELL 6L	WELL 6U
SAMPLE TYPE:	DUPLICATE	DUPLICATE	DUPLICATE	GW-LOW	GW-LOW
VOA	TOLUENE				
	ACETONE				
	METHYLENE CHLORIDE				
	2-BUTANONE				
	BENZENE				
	1,1-DICHLOROETHANE				
	1,1,1-TRICHLOROETHANE				
	TETRACHLOROETHENE				
	TRANS-1,2-DICHLOROETHENE				
	TRICHLOROETHENE				
	4-METHYL-2-PENTANONE				
	ETHYL BENZENE				
	XYLENES				
SEMI-VOA	PHENOL				
	BIS(2-ETHYLHEXYL)PHTHALATE				
	DIETHYLPHTHALATE				
	DI-N-BUTYL PHTHALATE				
	2-METHYLPHENOL				
	4-METHYLPHENOL				
	2,4-DIMETHYLPHENOL				
	NAPHTHALENE				
PEST/PCR	DIELDRIN				
	4-4'-DDD				
TIC-VOA	TETRAHYDROFURAN				
	METHANE, TRICHLOROFLUORO				
	UNKNOWN				
TIC-SEMI-VOA	ETHANE, 1,1-OXYRIS	(PUR 965) 12J			
	BENZENE, 1,2-DIMETHYL				
	BENZENE, 1,3-DIMETHYL				
	BENZENEACETIC ACID				
	PHENOL, TETRAMETHYLBUTYL				
	2-PROPANOL, METHOXY SUBSTITUTED				
	HEXANOIC ACID				
	HEXANOIC ACID, METHYL SUBST.				
	OCTANOIC ACID				
	BENZENEPROPANOIC ACID				
	UNKNOWN	7 J			
	UNKNOWN	16 J			
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				

SITE: #418 LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	00570/H00570	00578/H00578	00579/H00579	00552/H00522	00553/H00553
SAMPLE LOCATION:	WELL 40U	WELL 40L	WELL 40L	WELL 6L	WELL 6U
SAMPLE TYPE:	DUPLICATE	DUPLICATE	DUPLICATE	GW-LOW	GW-LOW

UNKNOWN						
TOTAL METALS	ALUMINUM	38800	70600	71300	5270	43900
	ANTIMONY					
	ARSENIC	6.1	13.9	12.1		32.4
	BARIUM	457	304	300	110	254
	BERYLLIUM		2	3		2
	CADMIUM			0.6		
	CALCIUM	148000	690000	760000	109000	1000000
	CHROMIUM	54	107	116	22	98
	COBALT		39	38		36
	COPPER	49	55	60		88
	IRON	35300	71200	76900	3660	94500
	LEAD	26.4	38.4	29.8	6.2	35.5
	MAGNESIUM	98000	341000	364000	60000	483000
	MANGANESE	736	2460	2640	119	3180
	MERCURY					
	NICKEL	46	89	97		117
	POTASSIUM	63900	24700	24100	3520	13900
	SELENIUM					
	SILVER					
	SODIUM	356000	79500	81400	21200	28500
	THALLIUM					
	VANADIUM					
	ZINC	63	130	131		102
		176	219	227		319
DIS METALS	ALUMINUM		259	389		
	ANTIMONY					
	ARSENIC		10.6			
	BARIUM	57	158	49	93	77
	BERYLLIUM					
	CADMIUM		1.2	0.6		
	CALCIUM	91400	50400	35200	96800	185000
	CHROMIUM	19			15	19
	COBALT					
	COPPER					
	IRON		500	336		
	LEAD					
	MAGNESIUM	66700	13600	12200	56400	86200
	MANGANESE	234	127	40	20	145
	MERCURY					
	NICKEL					
	POTASSIUM	52800	1780	1830	1950	1460
	SELENIUM					
	SILVER					

ALL CONCENTRATIONS IN ug/L

SITE: #41P LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	Q0570/HQ0570	Q0578/HQ0578	Q0579/HQ0579	Q0552/HQ0522	Q0553/HQ0553
SAMPLE LOCATION:	WELL 40U	WELL 40L	WELL 40L	WELL 6L	WELL 6U
SAMPLE TYPE:	DUPLICATE	DUPLICATE	DUPLICATE	GW-LOW	GW-LOW
SODIUM	394000	84900	96100	21100	27300
THALLIUM					
VANADIUM					
ZINC	63	212	84	18	
INORG. AMMONIA NITROGEN	27000	120	200		
INDIC. BROMIDE	4700	70			100
CHLORIDE	190000	5900		36000	9000
CYANIDE					
NITRATE NITROGEN	1110			480	
NITRITE NITROGEN		50			
POC	380				
POX	15				
SULFATE	105000	180000		207000	240000
TOC	34000	2600	2700	3500	12000
TOTAL PHENOLS	105	48	58	60	38
TOX	71			7	7
CARBONATE					
BICARBONATE					

ALL CONCENTRATIONS IN ug/L

SITE: #41B LAND RECLAMATION, WI  
CASE NO: 6277-1-1944HQ

SAMPLE NO:	Q0554/MQ0554	Q0555/MQ0555	Q0556/MQ0556	Q0557/MQ0557	Q0558/MQ0558
SAMPLE LOCATION:	WELL 108L	WELL 29U	WELL 14U	WELL 14L	WELL 29L
SAMPLE TYPE:	GW-LDW	GW-LDW	GW-LDW	GW-LDW	GW-LDW

VOA	TOLUENE				
	ACETONE			9.8 J	
	METHYLENE CHLORIDE				
	2-BUTANONE				
	BENZENE				
	1,1-DICHLOROETHANE				
	1,1,1-TRICHLOROETHANE				
	TETRACHLOROETHENE				
	TRANS-1,2-DICHLOROETHENE				
	TRICHLOROETHENE				
	4-METHYL-2-PENTANONE				
	ETHYL BENZENE				
	XYLENES				
SEMI-VOA	PHENOL				
	BIS(2-ETHYLHEXYL)PHTHALATE			4.6 J	
	DIETHYLPHTHALATE				
	DI-N-BUTYL PHTHALATE				
	2-METHYLPHENOL				
	4-METHYLPHENOL				
	2,4-DIMETHYLPHENOL				
	NAPHTHALENE				
PEST/PCR	DIELDRIN				
	4-4'-DDD				
TIC-VOA	TETRAHYDROFURAN				
	METHANE, TRICHLOROFLUORO				
	UNKNOWN				
TIC-SEMI-VOA	ETHANE, 1,1-OXYBIS				
	BENZENE, 1,2-DIMETHYL				
	BENZENE, 1,3-DIMETHYL				
	BENZENEACETIC ACID				
	PHENOL, TETRAMETHYLBUTYL				
	2-PROPANOL, METHOXY SUBSTITUTED				
	HEXANOIC ACID				
	HEXANOIC ACID, METHYL SUBST.				
	OCTANOIC ACID				
	BENZENEPROPANOIC ACID				
	UNKNOWN		15 J		
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				

ALL CONCENTRATIONS IN ug/L

SITE: #41R LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	00554/H00554	00555/H00555	00556/H00556	00557/H00557	00558/H00558
SAMPLE LOCATION:	WELL 108L	WELL 29U	WELL 14U	WELL 14L	WELL 29L
SAMPLE TYPE:	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW

UNKNOWN						
TOTAL METALS	ALUMINUM	18700	20000	156000	89000	66600
	ANTIMONY					
	ARSENIC		13.4	27.6	18.4	29
	BARIUM	123	352	751	482	404
	BERYLLIUM			6	3	3
	CADMIUM			0.7		
	CALCIUM	97500	391000	422000	448000	1160000
	CHROMIUM	34	45	195	102	97
	COBALT		25	56	36	40
	COPPER		46	107	54	83
	IRON	10900	36000	152000	76100	101000
	LEAD	12.4	19.2	108	66	51
	MAGNESIUM	51300	219000	231000	254000	560000
	MANGANESE	308	1400	1960	2310	4750
	MERCURY					
	NICKEL		62	172	81	109
	POTASSIUM	3960	9860	41000	20400	23600
	SELENIUM					
	SILVER					
	SODIUM	11400	24800	15600	46100	31100
	THALLIUM					
	VANADIUM		48	242	114	135
	ZINC	42	172	406	185	262
DIS METALS	ALUMINUM				156	
	ANTIMONY					
	ARSENIC			6.3		6.4
	BARIUM	332	244	247	328	250
	BERYLLIUM					
	CADMIUM					
	CALCIUM	71200	141000	68400	31900	22100
	CHROMIUM	21	27	20		10
	COBALT					
	COPPER				11	
	IRON	26			57	
	LEAD					
	MAGNESIUM	38100	104000	41800	15000	25300
	MANGANESE	37	345	156	83	10
	MERCURY					
	NICKEL					
	POTASSIUM	2120	2970	4010	1890	3480
	SELENIUM					
	SILVER					

ALL CONCENTRATIONS IN ug/l



SITE: #41P LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	Q0554/H00554	Q0555/H00555	Q0556/H00556	Q0557/H00557	Q0558/H00558
SAMPLE LOCATION:	WELL 108L	WELL 29U	WELL 14U	WELL 14L	WELL 29L
SAMPLE TYPE:	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW
SODIUM	14900	21600	13800	51400	31500
THALLIUM					
VANADIUM					
ZINC	272		118	242	65
INORG. AMMONIA NITROGEN			300	200	400
INDIC. BROMIDE					
CHLORIDE	2100	6700	5300	800	1300
CYANIDE					
NITRATE NITROGEN					
NITRITE NITROGEN					
POC		1900			
POX		9			
SULFATE	30000	35000	70000	30000	7100
TOC	4500	2800	3900	7400	3700
TOTAL PHENOLS			10		
TOX	21		8.8	6.3	8.2
CARBONATE					
BICARBONATE					

SITE: #41P LAND RECLAMATION, WI

CASE NO: 6277-L-1944HQ

SAMPLE NO:	00561/HQ0561	00562/HQ0562	00563/HQ0563	00565/HQ0565	00566/HQ0566
SAMPLE LOCATION:	WELL 30L	WELL 110U	WELL 39U	WELL 9U	WELL 10U
SAMPLE TYPE:	GW-LDW	GW-LDW	GW-LDW	GW-LDW	GW-LDW

VOA	TOLUENE			12	
	ACETONE			48	
	METHYLENE CHLORIDE				3 J
	2-BUTANONE				
	BENZENE			10	
	1,1-DICHLOROETHANE			2 J	
	1,1,1-TRICHLOROETHANE				
	TETRACHLOROETHENE			13	
	TRANS-1,2-DICHLOROETHENE			11	
	TRICHLOROETHENE			8.8	
	4-METHYL-2-PENTANONE			6.5 J	
	ETHYL BENZENE			14	
	XYLENES			70	
SEMI-VOA	PHENOL			52	
	BIS(2-ETHYLMETHYL)PHTHALATE	2.4 J			
	DIETHYLPHTHALATE				
	DI-N-BUTYL PHTHALATE			5.6 J	
	2-METHYLPHENOL			4.8	
	4-METHYLPHENOL			21	
	2,4-DIMETHYLPHENOL			28	
	NAPHTHALENE			2.2 J	
PEST/PCB	DIELDRIN			12	
	4-4'-DDD			15	
TIC-VOA	TETRAHYDROFURAN			(PUR 921) 18J	
	METHANE, TRICHLOROFLUORO	(PUR 943) 6 J			
	UNKNOWN			11 J	
TIC-SEMI-VOA	ETHANE, 1,1-DIOXYRIS				
	BENZENE, 1,2-DIMETHYL			(PUR 868) 24J	
	BENZENE, 1,3-DIMETHYL			(PUR 924) 29J	
	BENZENEACETIC ACID			(PUR 884) 47J	
	PHENOL, TETRAMETHYLBUTYL			(PUR 883) 27J	
	2-PROPANOL, METHOXY SUBSTITUTED			(PUR 912) 110J	
	HEXANOIC ACID				
	HEXANOIC ACID, METHYL SUBST.				
	OCTANOIC ACID				
	BENZENEPROPANOIC ACID				
	UNKNOWN		31 J	140 J	
	UNKNOWN		34 J	17 J	
	UNKNOWN			25 J	
	UNKNOWN			28 J	
	UNKNOWN			96 J	
	UNKNOWN			23 J	
	UNKNOWN			15 J	
	UNKNOWN			21 J	
	UNKNOWN			19 J	
	UNKNOWN			14 J	
	UNKNOWN			20 J	
	UNKNOWN			410 J	
	UNKNOWN			17 J	

ALL CONCENTRATIONS IN ug/L

SITE: 0418 LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	00561/M00561	00562/M00562	00563/M00563	00565/M00565	00566/M00566
SAMPLE LOCATION:	WELL 30L	WELL 110U	WELL 39U	WELL 9U	WELL 10U
SAMPLE TYPE:	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW

UNKNOWN				120 J		
TOTAL	ALUMINUM	22200	5700	30900	993	15900
METALS	ANTIMONY					
	ARSENIC	6		25.3		5.9
	BARIUM	200	119	228	86	128
	BERYLLIUM					
	CADMIUM					
	CALCIUM	91500	182000	135000	230000	209000
	CHROMIUM	22	14	30	18	24
	COBALT					
	COPPER			35		
	IRON	19400	5990	39800	6130	17300
	LEAD	17.8	5.7	165	4	19.2
	MAGNESIUM	59200	93700	46100	95300	107000
	MANGANESE	531	2760	1040	200	415
	MERCURY			0.4		
	NICKEL			47		
	POTASSIUM	8470	5530	38800	17500	8170
	SELENIUM					
	SILVER					
	SODIUM	31600	27800	95000	74200	25000
	THALLIUM					
	VANADIUM			38		
	ZINC	51	28	378	38	80
DIS	ALUMINUM			350		
METALS	ANTIMONY					
	ARSENIC			22.9		
	BARIUM	276	169	848	167	248
	BERYLLIUM					
	CADMIUM	3.1				
	CALCIUM	26200	150000	40800	254000	177000
	CHROMIUM		18		10	18
	COBALT					
	COPPER	11				
	IRON	42		293	3450	
	LEAD					
	MAGNESIUM	24800	78500	894	107000	88900
	MANGANESE	59	2700	18	198	125
	MERCURY					
	NICKEL					
	POTASSIUM	1720	3700	31600	20100	1880
	SELENIUM					
	SILVER					

ALL CONCENTRATIONS IN UG/L

SITE: #41B LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	Q0561/MQ0561	Q0562/MQ0562	Q0563/MQ0563	Q0565/MQ0565	Q0566/MQ0566
SAMPLE LOCATION:	WELL 30L	WELL 110U	WELL 39U	WELL 9U	WELL 10U
SAMPLE TYPE:	GW-LDW	GW-LDW	GW-LDW	GW-LDW	GW-LDW

	SODIUM	33800	30300	10200	86300	26300
	THALLIUM					
	VANADIUM					
	ZINC	155	73	499	99	202
INORG.	AMMONIA NITROGEN	200	110	24000	3800	1600
INDIC.	BROMIDE		80	2200	3100	5100
	CHLORIDE	1200	42000	100000	152000	47000
	CYANIDE			63		
	NITRATE NITROGEN				1320	2200
	NITRITE NITROGEN					
	POC			6700		
	PDX			62		
	SULFATE	28000	126000	4300	315000	438000
	TOC	6600	5500	67000	9200	1100
	TOTAL PHENOLS	10	20	272	100	15
	TOX		15	99	20	14
	CARBONATE					
	BICARBONATE					

ALL CONCENTRATIONS IN ug/L

SITE: #41B LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:		Q0567/MQ0567	Q0568/MQ0568	Q0575/MQ0575	Q0576/MQ0576	Q0580/MQ0580
SAMPLE LOCATION:		WELL 22L	WELL 22U	WELL 109U		
SAMPLE TYPE:		GW-LOW	GW-LOW	GW-LOW	SW-LOW	LEACHATE
VOA	TOLUENE					1000
	ACETONE				10	2100
	METHYLENE CHLORIDE					230
	2-BUTANONE					2200
	BENZENE					
	1,1-DICHLOROETHANE					220
	1,1,1-TRICHLOROETHANE					53 J
	TETRACHLOROETHENE					
	TRANS-1,2-DICHLOROETHENE					210
	TRICHLOROETHENE					
	4-METHYL-2-PENTANONE					210
	ETHYL BENZENE					120
	XYLENES					420
SEMI-VOA	PHENOL					190
	BIS(2-ETHYLHEXYL)PHTHALATE	2.4 J	4 J	2.4 J		110
	DIETHYLPHTHALATE					25 J
	DI-N-BUTYL PHTHALATE				2 J	14 J
	2-METHYLPHENOL					31 J
	4-METHYLPHENOL					850
	2,4-DIMETHYLPHENOL					12 J
	NAPHTHALENE					16 J
PEST/PCB	DIELDRIN					
	4-4'-DDD					
TIC-VOA	TETRAHYDROFURAN					
	METHANE, TRICHLOROFLUORO					
	UNKNOWN					
TIC-SEMI-VOA	ETHANE, 1,1-OXYRIS					
	BENZENE, 1,2-DIMETHYL					
	BENZENE, 1,3-DIMETHYL					
	BENZENEACETIC ACID					(PUR911) 620J
	PHENOL, TETRAMETHYLBUTYL					
	2-PROPANOL, METHOXY SUBSTITUTED					
	HEXANOIC ACID					IPUR919 10500J
	HEXANOIC ACID, METHYL SUBST.					IPUR958 10500J
	OCTANOIC ACID					IPUR 854 4700J
	BENZENEPROPANOIC ACID					IPUR 904 2600J
	UNKNOWN		10 J	12 J		4400 J
	UNKNOWN			61 J		2700 J
	UNKNOWN					1900 J
	UNKNOWN					320 J
	UNKNOWN					440 J
	UNKNOWN					140 J
	UNKNOWN					300 J
	UNKNOWN					110 J
	UNKNOWN					76 J
	UNKNOWN					870 J
	UNKNOWN					140 J
	UNKNOWN					71 J
	UNKNOWN					120 J

ALL CONCENTRATIONS IN ug/L

SITE: 041B LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	00567/HQ0567	00568/HQ0568	00575/HQ0575	00576/HQ0576	00580/HQ0580
SAMPLE LOCATION:	WELL 22L	WELL 22U	WELL 109U		
SAMPLE TYPE:	GW-LOW	GW-LOW	GW-LOW	SW-LOW	LEACHATE

UNKNOWN						
TOTAL METALS	ALUMINUM	126	22200	10200	2570	13300
	ANTIMONY					3.1
	ARSENIC		10			9.5
	BARIUM	39	287	85	86	760
	BERYLLIUM					
CADMIUM						
CALCIUM		34200	223000	134000	121000	183000
CHROMIUM			33	23	15	
COBALT						14
COPPER						25
IRON		313	22300	10200	1740	203000
LEAD			19.2	13.9		52.2
MAGNESIUM		18100	130000	67600	68500	156000
MANGANESE		21	590	255	75	475
MERCURY						
NICKEL					31	114
POTASSIUM		1140	13100	5250	8330	250000
SELENIUM						
SILVER						
SODIUM		66800	236000	12100	20400	595000
THALLIUM						
VANADIUM			27			38
ZINC			75	73		1120
DIS METALS	ALUMINUM					
	ANTIMONY					
	ARSENIC			6.4		
	BARIUM	126	353	140	79	297
	BERYLLIUM					
CADMIUM		0.5				
CALCIUM		36500	165000	136000	134000	107000
CHROMIUM		19	39		13	
COBALT						
COPPER						
IRON			721	260	102	9850
LEAD						
MAGNESIUM		18900	106000	69000		149000
MANGANESE		15	270	142	85	39
MERCURY						
NICKEL						
POTASSIUM		2060	4730	1740	8270	257000
SELENIUM					3.8	
SILVER						

ALL CONCENTRATIONS IN ug/L

SITE: #41B LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	Q0567/H00567	Q0568/H00568	Q0575/H00575	Q0576/H00576	Q0580/H00580
SAMPLE LOCATION:	WELL 22L	WELL 22U	WELL 109U		
SAMPLE TYPE:	GW-LOW	GW-LOW	GW-LOW	SW-LOW	LEACHATE

	SODIUM	72400	235000	13900	23100	625000
	THALLIUM					
	VANADIUM					
	ZINC	80	128	75	25	
INDRG.	AMMONIA NITROGEN		1200	800	200	145000
INDIC.	BROMIDE	300	6000			8500
	CHLORIDE	37000	400000	53000	150000	690000
	CYANIDE					
	NITRATE NITROGEN				1080	
	NITRITE NITROGEN				260	
	POC				100	4700
	POX					
	SULFATE	115000	165000	145000	488000	16000
	TOC	3500	21000	3000	8000	728000
	TOTAL PHENOLS	24	35		58	1100
	TOX	12	34	7	14	790
	CARBONATE					
	BICARBONATE					

ALL CONCENTRATIONS IN UG/L

## **APPENDIX 1**

### **Contract Required Detection Limits and Instrument Detection Limits for Metals, Inorganic, and Indicator Parameters**



TABLE A1-1

**CONTRACT REQUIRED DETECTION LIMITS AND INSTRUMENT  
DETECTION LIMITS FOR METALS, INORGANIC, AND INDICATOR PARAMETERS**

Parameter	CRDL	IDL
<b><u>Metals</u></b>		
Aluminum	200	100
Antimony	60	3
Arsenic	10	6
Barium	200	4
Beryllium	5	4
Cadmium	5	0.5
Calcium	5000	93
Chromium	10	8
Cobalt	50	16
Copper	25	12
Iron	100	10
Lead	5	2
Magnesium	5000	238
Manganese	15	3
Mercury	0.2	0.2
Nickel	40	20
Potassium	5000	2160
Selenium	5	3
Silver	10	10
Sodium	5000	156
Thallium	10	5
Vanadium	50	21
Zinc	20	12
<b><u>Inorganic and Indicators</u></b>		
Ammonia nitrogen	100	100
Bromide		50
Chloride	1000	1000
Cyanide	10	
Nitrate nitrogen	300	300
Nitrite nitrogen		50
POC	10	100
POX	5	5
Sulfate	1000	500
TOC	1000	1000
TOX	5	5
Total Phenols	10	10

concentrations are in µg/l

## APPENDIX 2

### SUMMARY OF CONCENTRATIONS FOR COMPOUNDS FOUND IN LOW LEVEL GROUND-WATER AND SAMPLING BLANK SAMPLES AT LAND RECLAMATION, WI

The following tables list 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.

Sample numbers are designated by the organic and corresponding inorganic sample number. Organic sample numbers are preceded by the prefix "Q;" inorganic sample numbers are preceded by the prefix "MQO."

## TABLE KEY

Value without a flag indicates a result above the contract required detection limit.

- 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  $\mu\text{g}$  and a concentration of 3  $\mu\text{g}$  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.

SITE: 041P LAND RECLAMATION, MI  
CASE NO: 6277-1-1944HQ

SAMPLE NO:		00560/H00560	00577/H00577	00559/H00559	00796/H00796	00569/H00569
SAMPLE LOCATION:						WELL 40U
SAMPLE TYPE:		FIELD BLK	FIELD BLK	EQUIP. BLK	TRIP BLK	DUPLICATE
VOA	TOLUENE		1.7 J	1.7 J		
	ACETONE					
	METHYLENE CHLORIDE					
	2-BUTANONE					
	BENZENE					
	1,1-DICHLOROETHANE					
	1,1,1-TRICHLOROETHANE					
	TETRACHLOROETHENE					
	TRANS-1,2-DICHLOROETHENE					
	TRICHLOROETHENE					
	4-METHYL-2-PENTANONE					
	ETHYL BENZENE					
	XYLENES					
SEMI-VOA	PHENOL		2.2 J		7 J	
	BIS(2-ETHYLHEXYL)PHTHALATE					
	DIETHYLPHTHALATE					
	DI-N-BUTYL PHTHALATE				2.8 J	2.2 J
	2-METHYLPHENOL					
	4-METHYLPHENOL					
	2,4-DIMETHYLPHENOL					
	NAPHTHALENE					
PEST/PCB	DIELDRIN					
	4-4'-DDD					
TIC-VOA	TETRAHYDROFURAN					
	METHANE, TRICHLOROFLUORO					
	UNKNOWN					
TIC-SEMI-VOA	ETHANE, 1,1-DIBROMO					(PUR 962) 11 J
	BENZENE, 1,2-DIMETHYL					
	BENZENE, 1,3-DIMETHYL					
	BENZENEACETIC ACID					
	PHENOL, TETRAMETHYLBUTYL					
	2-PROPANOL, METHOXY SUBSTITUTED					
	HEXANOIC ACID					
	HEXANOIC ACID, METHYL SUBST.					
	OCTANOIC ACID					
	BENZENEPROPANOIC ACID					
	UNKNOWN					25 J
	UNKNOWN					20 J
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					

ALL CONCENTRATIONS IN ug/L

SITE: 9412 LAND FILL, TOWN: MI  
CASE NO: 6277-L-1944H7

SAMPLE NO:		00560/H00560	00577/H00577	00559/H00559	00796/H00796	00569/H00569
SAMPLE LOCATION:						WELL 40U
SAMPLE TYPE:		FIELD BLK	FIELD BLK	EQUIP. BLK	TRIP BLK	DUPLICATE
UNKNOWN						
TOTAL	ALUMINUM					30700
METALS	ANTIMONY					
	ARSENIC					
	BARIUM					410
	BERYLLIUM					
	CADMIUM					
	CALCIUM	100	97	177	320	147000
	CHROMIUM				25	56
	COBALT					18
	COPPER					46
	IRON				26	36200
	LEAD					
	MAGNESIUM					96700
	MANGANESE					724
	MERCURY					
	NICKEL					52
	POTASSIUM					59300
	SELENIUM					
	SILVER					
	SODIUM	519	429	390	588	354000
	THALLIUM					
	VANADIUM					57
	ZINC					173
DIS	ALUMINUM			119		
METALS	ANTIMONY					
	ARSENIC					21
	BARIUM					92
	BERYLLIUM					
	CADMIUM					
	CALCIUM	110	144	135	308	101000
	CHROMIUM			11		18
	COBALT					
	COPPER					
	IRON					26
	LEAD					
	MAGNESIUM					72100
	MANGANESE					264
	MERCURY					
	NICKEL					
	POTASSIUM					56400
	SELENIUM					
	SILVER					

CALL CONCENTRATIONS IN ug/L

A2-4

SITE: 041R LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	00560/HQ0560	00577/HQ0577	00559/HQ0559	00796/HQ0796	00569/HQ0569
SAMPLE LOCATION:					WELL 40U
SAMPLE TYPE:	FIELD BLK	FIELD BLK	EQUIP. BLK	TRIP BLK	DUPLICATE
SODIUM	502	535	485	733	386000
THALLIUM					
VANADIUM					
ZINC					72
INDRG. AMMONIA NITROGEN					35000
INDIC. BROMIDE				60	4800
CHLORIDE				2200	280000
CYANIDE					
NITRATE NITROGEN				9	50
NITRITE NITROGEN					
POC					
PDX					
SULFATE					140000
TOC	1200				41000
TOTAL PHENDLS		20		96	105
TOX					54
CARBONATE					
BICARBONATE					

ALL CONCENTRATIONS IN ug/L

CASE NO: 6277-L-1944HQ

SAMPLE NO:	00570/M00570	00578/M00578	00579/M00579	00552/M00552	00553/M00553
SAMPLE LOCATION:	WELL 40U	WELL 40L	WELL 40L	WELL 6L	WELL 6U
SAMPLE TYPE:	DUPLICATE	DUPLICATE	DUPLICATE	GW-LOW	GW-LOW

VOA	TOLUENE					
	ACETONE					
	METHYLENE CHLORIDE					
	2-BUTANONE					
	BENZENE					
	1,1-DICHLOROETHANE					
	1,1,1-TRICHLOROETHANE					
	TETRACHLOROETHENE					
	TRANS-1,2-DICHLOROETHENE					
	TRICHLOROETHENE					
	4-METHYL-2-PENTANONE					
	ETHYL BENZENE					
	XYLENES					
SEMI-VOA	PHENOL					
	BIS(2-ETHYLHEXYL)PHTHALATE					
	DIETHYLPHTHALATE					
	DI-N-BUTYL PHTHALATE					
	2-METHYLPHENOL					
	4-METHYLPHENOL					
	2,4-DIMETHYLPHENOL					
	NAPHTHALENE					
PEST/PCR	DIELDRIN					
	4-4'-DDD					
TIC-VOA	TETRAHYDROFURAN					
	METHANE, TRICHLOROFLUORO					
	UNKNOWN					
TIC-SEMI-VOA	ETHANE, 1,1-OXYBIS	(PUR 965) 12J				
	BENZENE, 1,2-DIMETHYL					
	BENZENE, 1,3-DIMETHYL					
	BENZENEACETIC ACID					
	PHENOL, TETRAMETHYLBUTYL					
	2-PROPANOL, METHOXY SUBSTITUTED					
	HEXANOIC ACID					
	HEXANOIC ACID, METHYL SUBST.					
	OCTANOIC ACID					
	BENZENEPROPANOIC ACID					
	UNKNOWN	7 J				
	UNKNOWN	16 J				
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					
	UNKNOWN					

ALL CONCENTRATIONS IN µg/L

SITE: 941E LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:		80570/H00570	80578/H00578	80579/H00579	80552/H00522	80553/H00553
SAMPLE LOCATION:		WELL 40U	WELL 40L	WELL 40L	WELL 6L	WELL 6U
SAMPLE TYPE:		DUPLICATE	DUPLICATE	DUPLICATE	GW-LOW	GW-LOW
UNKNOWN						
TOTAL	ALUMINUM	38800	70600	71300	5270	43900
METALS	ANTIMONY					
	ARSENIC	6.1	13.9	12.1		32.4
	BARIUM	457	304	300	110	254
	BERYLLIUM		2	3		2
	CADMIUM			0.6		
	CALCIUM	148000	690000	760000	109000	1000000
	CHROMIUM	54	107	116	22	98
	COBALT		39	38		36
	COPPER	49	55	60		88
	IRON	35300	71200	76900	3660	94500
	LEAD	26.4	38.4	29.8	6.2	35.5
	MAGNESIUM	98000	341000	364000	60000	483000
	MANGANESE	736	2460	2640	119	3180
	MERCURY					
	NICKEL	46	89	97		117
	POTASSIUM	63900	24700	24100	3520	13900
	SELENIUM					
	SILVER					
	SODIUM	356000	79500	81400	21200	28500
	THALLIUM					
	VANADIUM	63	130	131		102
	ZINC	176	219	227		319
EDIS	ALUMINUM		259	389		
METALS	ANTIMONY					
	ARSENIC		10.6			
	BARIUM	57	158	49	93	77
	BERYLLIUM					
	CADMIUM		1.2	0.6		
	CALCIUM	91400	50400	35200	96800	185000
	CHROMIUM	19			15	19
	COBALT					
	COPPER					
	IRON		500	336		
	LEAD					
	MAGNESIUM	66700	13600	12200	56400	86200
	MANGANESE	234	127	40	20	145
	MERCURY					
	NICKEL					
	POTASSIUM	52800	1780	1830	1950	1460
	SELENIUM					
	SILVER					

ALL CONCENTRATIONS IN ug/L

A2-7



SITE: #41P LAND RECLAMATION, MI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	80570/M00570	80578/M00578	80579/M00579	80552/M00522	80553/M00553
SAMPLE LOCATION:	WELL 40U	WELL 40L	WELL 40L	WELL 6L	WELL 6U
SAMPLE TYPE:	DUPLICATE	DUPLICATE	DUPLICATE	GW-LOW	GW-LOW
SODIUM	394000	84900	96100	21100	27300
THALLIUM					
VANADIUM					
ZINC	63	212	84	18	
INORG. AMMONIA NITROGEN	27000	120	200		
INDIC. BROMIDE	4700	70			100
CHLORIDE	190000	5900		36000	9000
CYANIDE					
NITRATE NITROGEN	1110			480	
NITRITE NITROGEN		50			
POC	380				
POX	15				
SULFATE	105000	180000		207000	240000
TOC	34000	2600	2700	3500	12000
TOTAL PHENOLS	105	48	58	60	38
TOX	71			7	7
CARBONATE					
BICARBONATE					

ALL CONCENTRATIONS IN ug/L

SITE: 0418 LAND RECLAMATION, WI

CASE NO: 6277-L-1944HD

SAMPLE NO:	00554/00554	00555/00555	00556/00556	00557/00557	00558/00558
SAMPLE LOCATION:	WELL 108L	WELL 29U	WELL 14U	WELL 14L	WELL 29L
SAMPLE TYPE:	GW-LON	GW-LON	GW-LON	GW-LON	GW-LON

VOA	TOLUENE				
	ACETONE			9.8 J	
	METHYLENE CHLORIDE				
	2-BUTANONE				
	BENZENE				
	1,1-DICHLOROETHANE				
	1,1,1-TRICHLOROETHANE				
	TETRACHLOROETHENE				
	TRANS-1,2-DICHLOROETHENE				
	TRICHLOROETHENE				
	4-METHYL-2-PENTANONE				
	ETHYL BENZENE				
	XYLENES				
SEMI-VOA	PHENOL				
	BIS(2-ETHYLHEXYL)PHTHALATE			4.6 J	
	DIETHYLPHTHALATE				
	DI-N-BUTYL PHTHALATE				
	2-METHYLPHENOL				
	4-METHYLPHENOL				
	2,4-DIMETHYLPHENOL				
	NAPHTHALENE				
PEST/PCB	DIELDRIN				
	4-4'-DDD				
TIC-VOA	TETRAHYDROFURAN				
	METHANE, TRICHLOROFLUORO				
	UNKNOWN				
TIC-SEMI-VOA	ETHANE, 1,1-DIOXYBIS				
	BENZENE, 1,2-DIMETHYL				
	BENZENE, 1,3-DIMETHYL				
	BENZENEACETIC ACID				
	PHENOL, TETRAMETHYLBUTYL				
	2-PROPANOL, METHOXY SUBSTITUTED				
	HEXANOIC ACID				
	HEXANOIC ACID, METHYL SUBST.				
	OCTANOIC ACID				
	BENZENEPROPANOIC ACID				
	UNKNOWN		15 J		
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				
	UNKNOWN				

ALL CONCENTRATIONS IN ug/L

SITE: #41P LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	Q0554/M00554	Q0555/M00555	Q0556/M00556	Q0557/M00557	Q0558/M00558
SAMPLE LOCATION:	WELL 108L	WELL 29U	WELL 14U	WELL 14L	WELL 29L
SAMPLE TYPE:	GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW

UNKNOWN						
TOTAL METALS	ALUMINUM	18700	20000	156000	89000	66600
	ANTIMONY					
	ARSENIC		13.4	27.6	18.4	29
	BARIUM	123	352	751	482	404
	BERYLLIUM			6	3	3
	CADMIUM			0.7		
	CALCIUM	97500	391000	422000	448000	1160000
	CHROMIUM	34	45	195	102	97
	COBALT		25	56	36	40
	COPPER		46	107	54	83
	IRON	10900	36000	152000	76100	101000
	LEAD	12.4	19.2	108	66	51
	MAGNESIUM	51300	219000	231000	254000	560000
	MANGANESE	308	1400	1960	2310	4750
	MERCURY					
	NICKEL		62	172	81	109
	POTASSIUM	3960	9860	41000	20400	23600
	SELENIUM					
	SILVER					
	SODIUM	11400	24800	15600	46100	31100
DIS METALS	THALLIUM					
	VANADIUM		48	242	114	135
	ZINC	42	172	406	185	262
	ALUMINUM				156	
	ANTIMONY					
	ARSENIC			6.3		6.4
	BARIUM	332	244	247	328	250
	BERYLLIUM					
	CADMIUM					
	CALCIUM	71200	141000	69400	31900	22100
	CHROMIUM	21	27	20		10
	COBALT					
	COPPER				11	
	IRON	26			57	
	LEAD					
	MAGNESIUM	38100	104000	41800	15000	25300
	MANGANESE	37	345	156	83	10
	MERCURY					
	NICKEL					
	POTASSIUM	2120	2870	4010	1890	3480
	SELENIUM					
	SILVER					

ALL CONCENTRATIONS IN ug/L

SITE: #41P LAKE RECLAMATION, MI

CASE NO: 6277-L-1944HQ

SAMPLE NO:	Q0554/HQ0554	Q0555/HQ0555	Q0556/HQ0556	Q0557/HQ0557	Q0558/HQ0558
SAMPLE LOCATION:	WELL 108L	WELL 29U	WELL 14U	WELL 14L	WELL 29L
SAMPLE TYPE:	SW-LDN	SW-LDN	SW-LDN	SW-LDN	SW-LDN
SODIUM	14900	21600	13800	51400	31500
THALLIUM					
VANADIUM					
ZINC	272		118	242	65
INDIC. AMMONIA NITROGEN			300	200	400
INDIC. BROMIDE					
CHLORIDE	2100	6700	5300	800	1300
CYANIDE					
NITRATE NITROGEN					
NITRITE NITROGEN					
POC		1900			
PDX		9			
SULFATE	30000	35000	70000	30000	7100
TDC	4500	2800	3900	7400	3700
TOTAL PHENOLS			10		
TOX	21		8.8	6.3	8.2
CARBONATE					
BICARBONATE					

ALL CONCENTRATIONS IN ug/L

SITE: #418 LAND RECLAMATION, MT

CASE NO: 6277-L-1944HD

SAMPLE NO:		00561/M00561	00562/M00562	00563/M00563	00565/M00565	00566/M00566
SAMPLE LOCATION:		WELL 30L	WELL 110U	WELL 39U	WELL 9U	WELL 10U
SAMPLE TYPE:		GW-LOW	GW-LOW	GW-LOW	GW-LOW	GW-LOW
VOA	TOLUENE			12		
	ACETONE			48		
	METHYLENE CHLORIDE					3 J
	2-BUTANONE					
	BENZENE			10		
	1,1-DICHLOROETHANE			2 J		
	1,1,1-TRICHLOROETHANE					
	TETRACHLOROETHENE			13		
	TRANS-1,2-DICHLOROETHENE			11		
	TRICHLOROETHENE			8.8		
	4-METHYL-2-PENTANONE			6.5 J		
	ETHYL BENZENE			14		
	XYLENES			70		
SEMI-VOA	PHENOL			52		
	BIS(2-ETHYLHEXYL)PHTHALATE	2.4 J				
	DIETHYLPHTHALATE					
	DI-N-BUTYL PHTHALATE				5.6 J	
	2-METHYLPHENOL			4.8		
	4-METHYLPHENOL			21		
	2,4-DIMETHYLPHENOL			28		
	NAPHTHALENE			2.2 J		
PEST/PCB	DIELDRIN			12		
	4-4'-DDD			15		
TIC-VOA	TETRAHYDROFURAN			(PUR 921) 18J		
	METHANE, TRICHLOROFLUORO	(PUR 943) 6 J				
	UNKNOWN			11 J		
TIC-SEMI-VOA	ETHANE, 1,1-DIOXYRIS					
	BENZENE, 1,2-DIMETHYL			(PUR 868) 24J		
	BENZENE, 1,3-DIMETHYL			(PUR 924) 29J		
	BENZENEACETIC ACID			(PUR 884) 47J		
	PHENOL, TETRAMETHYLBUTYL			(PUR 883) 27J		
	2-PROPANOL, METHOXY SUBSTITUTED			(PUR 912) 110J		
	HEXANOIC ACID					
	HEXANOIC ACID, METHYL SUBST.					
	OCTANOIC ACID					
	BENZENEPROPANOIC ACID					
	UNKNOWN		31 J	140 J		
	UNKNOWN		34 J	17 J		
	UNKNOWN			25 J		
	UNKNOWN			28 J		
	UNKNOWN			96 J		
	UNKNOWN			23 J		
	UNKNOWN			15 J		
	UNKNOWN			21 J		
	UNKNOWN			19 J		
	UNKNOWN			14 J		
	UNKNOWN			20 J		
	UNKNOWN			410 J		
	UNKNOWN			17 J		

ALL CONCENTRATIONS IN ug/L

SITE: 4418 LAND RECLAMATION, MI

CASE NO: 6277-L-1944HQ

SAMPLE NO:	80561/M00561	80562/M00562	80563/M00563	80565/M00565	80566/M00566
SAMPLE LOCATION:	WELL 30L	WELL 110U	WELL 39U	WELL 9U	WELL 10U
SAMPLE TYPE:	GW-LDW	GW-LDW	GW-LDW	GW-LDW	GW-LDW

UNKNOWN				120 J		
TOTAL METALS	ALUMINUM	22200	5700	30900	993	15900
	ANTIMONY					
	ARSENIC	6		25.3		5.9
	BARIUM	200	119	228	86	128
	BERYLLIUM					
	CADMIUM					
	CALCIUM	91500	182000	135000	230000	209000
	CHROMIUM	22	14	30	18	24
	COBALT					
	COPPER			35		
	IRON	19400	5990	39800	6130	17300
	LEAD	17.8	5.7	165	4	19.2
	MAGNESIUM	59200	93700	46100	95300	107000
	MANGANESE	531	2760	1040	200	415
	MERCURY			0.4		
DIS METALS	NICKEL			47		
	POTASSIUM	8470	5530	38800	17500	8170
	SELENIUM					
	SILVER					
	SODIUM	31600	27800	95000	74200	25000
	THALLIUM					
	VANADIUM			38		
	ZINC	51	28	378	38	80
	ALUMINUM			350		
	ANTIMONY					
	ARSENIC			22.9		
	BARIUM	276	169	848	167	248
	BERYLLIUM					
	CADMIUM	3.1				
	CALCIUM	26200	150000	40800	254000	177000
	CHROMIUM		18		10	18
	COBALT					
	COPPER	11				
	IRON	42		293	3450	
	LEAD					
	MAGNESIUM	24800	78500	894	107000	88900
	MANGANESE	59	2700	18	198	125
	MERCURY					
	NICKEL					
	POTASSIUM	1720	3700	31600	20100	1880
	SELENIUM					
	SILVER					

ALL CONCENTRATIONS IN UG/L

SITE: #418 LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	80561/M00561	80562/M00562	80563/M00563	80565/M00565	80566/M00566
SAMPLE LOCATION:	WELL 30L	WELL 110U	WELL 39U	WELL 9U	WELL 10U
SAMPLE TYPE:	GW-LDW	GW-LDW	GW-LDW	GW-LDW	GW-LDW

	SODIUM	33800	30300	10200	86300	26300
	THALLIUM					
	VANADIUM					
	ZINC	155	73	499	99	202
INORG.	AMMONIA NITROGEN	200	110	24000	3800	1600
INDIC.	BROMIDE		80	2200	3100	5100
	CHLORIDE	1200	42000	100000	152000	47000
	CYANIDE			63		
	NITRATE NITROGEN				1320	2200
	NITRITE NITROGEN					
	POC			6700		
	POX			62		
	SULFATE	28000	126000	4300	315000	438000
	TOC	6600	5500	67000	9200	1100
	TOTAL PHENOLS	10	20	272	100	15
	TOX		15	99	20	14
	CARBONATE					
	BICARBONATE					

ALL CONCENTRATIONS IN ug/L

SITE: #41P LAND RECLAMATION, MI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:		00567/H00567	00568/H00568	00575/H00575	00576/H00576	00580/H00580
SAMPLE LOCATION:		WELL 22L	WELL 22U	WELL 109U		
SAMPLE TYPE:		SV-LOW	SV-LOW	SV-LOW	SV-LOW	LEACHATE
VOA	TOLUENE					1000
	ACETONE				10 -	2100
	METHYLENE CHLORIDE					230
	2-BUTANONE					2200
	BENZENE					
	1,1-DICHLOROETHANE					220
	1,1,1-TRICHLOROETHANE					53 J
	TETRACHLOROETHENE					
	TRANS-1,2-DICHLOROETHENE					210
	TRICHLOROETHENE					
	4-METHYL-2-PENTANONE					210
	ETHYL BENZENE					120
	XYLENES					420
SEMI-VOA	PHENOL					190
	BIS(2-ETHYLHEXYL)PHTHALATE	2.4 J	4 J	2.4 J		110
	DIETHYLPHTHALATE					25 J
	DI-N-BUTYL PHTHALATE				2 J	14 J
	2-METHYLPHENOL					31 J
	4-METHYLPHENOL					850
	2,4-DIMETHYLPHENOL					12 J
	NAPHTHALENE					16 J
PEST/PCB	DIELDRIN					
	4-4'-DDD					
TIC-VOA	TETRAHYDROFURAN					
	METHANE, TRICHLOROFLUORO					
	UNKNOWN					
TIC-SEMI-VOA	ETHANE, 1,1-DIOXYBIS					
	BENZENE, 1,2-DIMETHYL					
	BENZENE, 1,3-DIMETHYL					
	BENZENEACETIC ACID					(PUR911) 620J
	PHENOL, TETRAMETHYLBUTYL					
	2-PROPANOL, METHOXY SUBSTITUTED					
	HEXANOIC ACID					IPUR919 10500J
	HEXANOIC ACID, METHYL SUBST.					IPUR958 10500J
	OCTANOIC ACID					IPUR 854 4700J
	BENZENEPROPANOIC ACID					IPUR 904 2600J
	UNKNOWN		10 J	12 J		4400 J
	UNKNOWN			61 J		2700 J
	UNKNOWN					1900 J
	UNKNOWN					320 J
	UNKNOWN					440 J
	UNKNOWN					140 J
	UNKNOWN					300 J
	UNKNOWN					110 J
	UNKNOWN					76 J
	UNKNOWN					870 J
	UNKNOWN					140 J
	UNKNOWN					71 J
	UNKNOWN					120 J

ALL CONCENTRATIONS IN ug/L



SITE: 041B LAND RECLAMATION, MI  
CASE NO: 4277-L-1944HQ

SAMPLE NO:	00567/M00567	00568/M00568	00575/M00575	00576/M00576	00580/M00580
SAMPLE LOCATION:	WELL 22L	WELL 22U	WELL 109U		
SAMPLE TYPE:	SV-LOW	SV-LOW	SV-LOW	SV-LOW	LEACHATE

UNKNOWN						
TOTAL METALS	ALUMINUM	126	22200	10200	2570	13300
	ANTIMONY					3.1
	ARSENIC		10			9.5
	BARIUM	39	287	85	86	760
	BERYLLIUM					
	CADMIUM					
	CALCIUM	34200	223000	134000	121000	183000
	CHROMIUM		33	23	15	
	CORALT					14
	COPPER					25
	IRON	313	22300	10200	1740	203000
	LEAD		19.2	13.9		52.2
	MAGNESIUM	18100	130000	67600	68500	156000
	MANGANESE	21	590	255	75	475
	MERCURY					
	NICKEL				31	114
	POTASSIUM	1140	13100	5250	8330	250000
	SELENIUM					
	SILVER					
	SODIUM	66800	236000	12100	20400	595000
	THALLIUM					
	VANADIUM		27			38
	ZINC		75	73		1120
DIS METALS	ALUMINUM					
	ANTIMONY					
	ARSENIC			6.4		
	BARIUM	126	353	140	79	297
	BERYLLIUM					
	CADMIUM	0.5				
	CALCIUM	34500	165000	136000	134000	107000
	CHROMIUM	19	39		13	
	CORALT					
	COPPER					
	IRON		721	260	102	9950
	LEAD					
	MAGNESIUM	18900	106000	69000		149000
	MANGANESE	15	270	142	85	39
	MERCURY					
	NICKEL					
	POTASSIUM	2060	4730	1740	8270	257000
	SELENIUM				3.8	
	SILVER					

ALL CONCENTRATIONS IN US/L

SITE: 041B LAND RECLAMATION, WI  
CASE NO: 6277-L-1944HQ

SAMPLE NO:	00567/M00567	00568/M00568	00575/M00575	00576/M00576	00580/M00580
SAMPLE LOCATION:	WELL 22L	WELL 22U	WELL 109U		
SAMPLE TYPE:	GW-LOW	GW-LOW	GW-LOW	GW-LOW	LEACHATE
SODIUM	72400	235000	13900	23100	625000
THALLIUM					
VANADIUM					
ZINC	80	128	75	25	
INDRG. AMMONIA NITROGEN		1200	800	200	145000
INDIC. BROMIDE	300	6000			8500
CHLORIDE	37000	400000	53000	150000	690000
CYANIDE					
NITRATE NITROGEN				1080	
NITRITE NITROGEN				260	
POC				100	4700
POX					
SULFATE	115000	165000	145000	488000	16000
TOC	3500	21000	3000	8000	728000
TOTAL PHENOLS	24	35		58	1100
TOX	12	34	7	14	790
CARBONATE					
BICARBONATE					

ALL CONCENTRATIONS IN MG/L

A P P E N D I X - C

SUMMARY OF LRL's CONTRACT LABORATORY PERFORMANCE EVALUATION STUDIES

T A B L E C-1

SUMMARY OF WATER SUPPLY PERFORMANCE EVALUATION STUDIES

INORGANICS

Parameters	7/86	1/86	7/85	1/85	7/84	7/83	1/83
Arsenic	1N 2A	A N	D D	D D	D D	N N	N N
Barium	1A 2A	D D	D D	D D	D D	N N	N N
Cadmium	1N 2N	N N	D D	D D	D D	N A	N N
Chromium	1N 2A	N A	D D	D D	D D	N A	N N
Lead	1N 2N	A N	D D	D D	D D	A N	N N
Mercury	1N 2N	A N	D D	D D	D D	A A	N N
Selenium	1A 2N	A A	D D	D D	D D	A A	N N
Silver	1N 2A	D D	D D	D D	D D	N N	N N
Nitrate	1A 2A	A A	A A	A A	N N	A A	A N
Calcium	1A	D	A	D	N	D	D
Sodium	1N	D	N	A	A	D	D

A - Acceptable  
N - Not Acceptable  
1 - Concentrate 1

C - Check for Error  
D - Data not Reported  
2 - Concentrate 2

# TABLE C-2

## SUMMARY OF WATER POLLUTION PERFORMANCE EVALUATION STUDIES

### INORGANICS

Parameters	5/86	11/85	5/85	11/84	5/84	12/83
Aluminum	1A 2A	D D	N C	D D	D D	N C
Arsenic	1A 2A	A A	A N	A A	A A	N N
Beryllium	1A 2A	D D	D D	D D	A A	A A
Cadmium	1A 2A	A A	A C	A A	A A	A A
Cobalt	1A 2A	D D	N N	D D	A C	A A
Chromium	1A 2A	A A	N A	A N	A A	A A
Cooper	1A 2A	N N	N N	A A	A A	A A
Iron	1A 2C	N A	A A	A A	A A	N D
Mercury	1A 2A	A A	A N	N A	N D	A A
Manganese	1A 2A	A N	A A	D D	A A	A A
Nickel	1C 2N	N A	A A	A A	A A	A A
Lead	1A 2A	A A	C A	A A	A A	N N
Selenium	1A 2A	C N	A C	N A	A A	N N
Zinc	1A 2A	N C	C A	A N	A A	N A

A - Acceptable  
N - Not Acceptable  
1 - Concentrate 1

C - Check for Error  
D - Data not Reported  
2 - Concentrate 2

T A B L E C-2 (Cont'd)

SUMMARY OF WATER POLLUTION PERFORMANCE EVALUATION STUDIES

INORGANICS

Parameters	5/86	11/85	5/85	11/84	5/84	12/83
Calcium	1A 2N	A N	N N	D D	N N	A A
Magnesium	1A 2A	N N	N A	D D	A N	A C
Sodium	1N 2N	N N	N N	D D	A A	N N
Potassium	1C 2C	N N	C A	D D	A A	A A
Chloride	1A 2A	N N	A A	D D	A A	A A
Sulfate	1A 2A	N N	A A	D D	A N	A A
Ammonia-Nitrogen	1N 2N	A C	N N	D D	D D	A A
Nitrate-Nitrogen	1A 2A	A A	A A	C C	D D	N A
TOC	1A 2A	A A	A A	D D	A A	D D
Total Cyanide	1A 2A	D D	N N	D D	N N	N N
Total Phenolics	1A 2A	A A	D D	D D	D D	D D
Spec. Cond.	1A 2A	D D	A A	A A	N N	A C

A - Acceptable  
N - Not Acceptable  
1 - Concentrate 1

C - Check for Error  
D - Data not Reported  
2 - Concentrate 2

T A B L E C-3

SUMMARY OF WATER POLLUTION PERFORMANCE EVALUATION STUDIES

INORGANICS AND ORGANICS \*

PARAMETERS	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE**	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
DEMANDS IN MILLIGRAMS PER LITER:						
COD	1	31	47.0	31.0- 59.0	34.6- 55.4	CHECK FOR ERROR
	2	54	78.8	54.7- 93.6	59.7- 88.6	NOT ACCEPTABLE
TOC	1	20	18.4	10.7- 26.3	13.0- 23.9	ACCEPTABLE
	2	34	30.9	19.8- 41.7	23.1- 38.4	ACCEPTABLE
5-DAY BOD	1	23	31.1	18.3- 42.9	21.4- 39.8	ACCEPTABLE
	2	39	52.1	31.3- 71.1	36.3- 66.1	ACCEPTABLE
PCBs IN MICROGRAMS PER LITER:						
PCB-AROCLOR 1242	1	2.0	1.14 D.L. - 2.36		.320- 201	ACCEPTABLE
PESTICIDES IN MICROGRAMS PER LITER:						
ALDRIN	1	0.67	0.455	.124- .612	.187- .548	NOT ACCEPTABLE
	2	1.0	0.683	.186- .888	.277- .797	NOT ACCEPTABLE
ALDRIN	1	0.70	0.181	.0913- .275	.116- .250	NOT ACCEPTABLE
	2	2.7	0.906	.431- 1.22	.534- 1.12	NOT ACCEPTABLE
DDE	1	0.25	0.074	.0393- .152	.0540- .137	NOT ACCEPTABLE
	2	2.8	0.662	.284- .955	.373- .865	NOT ACCEPTABLE
DDT	1	1.4	0.251	.0816- .402	.124- .359	NOT ACCEPTABLE
	2	0.58	0.670	.293- .960	.382- .871	ACCEPTABLE
HEPTACHLOR	1	1.1	0.602	.151- .870	.245- .776	NOT ACCEPTABLE
	2	0.31	0.226	.0710- .316	.104- .283	CHECK FOR ERROR
HEPTACHLOR EPOXIDE	1	1.6	0.764	.332- 1.05	.413- .951	NOT ACCEPTABLE
	2	0.44	0.176	.103- .251	.122- .231	NOT ACCEPTABLE

\* WATER POLLUTION STUDY (WPS) 012 5/24/84

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

D.L. STANDS FOR DETECTION LIMIT

T A B L E C-3 (Cont'd)

SUMMARY OF WATER POLLUTION PERFORMANCE EVALUATION STUDIES

ORGANICS

PARAMETERS	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PESTICIDES IN MICROGRAMS PER LITER:						
CHLORDANE	5	20	9.28	3.94- 12.3	5.05- 11.2	NOT ACCEPTABLE
	6	4.4	2.16	1.03- 3.11	1.30- 2.83	NOT ACCEPTABLE
V. ORGANICS IN MICROGRAMS PER LITER:						
1,2 DICHLOROETHANE	1	42	32.1	19.4- 46.1	23.1- 42.5	ACCEPTABLE
	2	12	6.43	2.91- 9.86	3.83- 8.94	NOT ACCEPTABLE
1,1,1 TRICHLOROETHANE	1	108	79.6	48.8- 112.	57.5- 103.	CHECK FOR ERROR
	2	20	13.9	7.87- 20.5	9.61- 18.8	CHECK FOR ERROR
TRICHLOROETHENE	1	107	96.0	61.5- 121.	69.4- 113.	ACCEPTABLE
	2	10	7.20	3.19- 11.4	4.31- 10.2	ACCEPTABLE
TETRACHLOROETHENE	1	25	32.9	19.0- 45.5	22.6- 41.9	ACCEPTABLE
	2	14	8.78	4.57- 13.1	5.73- 11.9	NOT ACCEPTABLE
CHLOROBENZENE	1	91	87.8	52.2- 125.	62.5- 115.	ACCEPTABLE
	2	43	34.6	19.9- 49.9	24.2- 45.7	ACCEPTABLE
PURGEABLES IN MICROGRAMS PER LITER:						
BENZENE	1	6.2	6.40	2.40- 10.6	3.59- 9.36	ACCEPTABLE
	2	40	48.3	26.5- 71.4	33.1- 64.9	ACCEPTABLE
ETHYLBENZENE	1	18	13.0	7.11- 19.3	8.86- 17.5	CHECK FOR ERROR
	2	65	55.1	30.7- 80.9	37.4- 74.2	ACCEPTABLE
TOLUENE	1	22	17.4	9.55- 25.8	11.9- 23.4	ACCEPTABLE
	2	54	51.1	28.2- 69.6	33.7- 64.1	ACCEPTABLE

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



T A B L E C-3 (Cont'd)

SUMMARY OF WATER POLLUTION PERFORMANCE EVALUATION STUDIES

INORGANICS AND ORGANICS \*

PARAMETERS	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE**	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
FLUORIDE	1	1.5	1.30	1.12- 1.45	1.16- 1.41	NOT ACCEPTABLE
	2	0.9	0.822	.670- .921	.703- .889	CHECK FOR ERROR
SULFATE	1	140	131	111.- 148.	115.- 143.	ACCEPTABLE
	2	8.0	7.00	4.14- 9.65	4.86- 8.93	ACCEPTABLE
NUTRIENTS IN MILLIGRAMS PER LITER:						
AMMONIA-NITROGEN	1	5.1	3.10	2.42- 3.72	2.58- 3.56	NOT ACCEPTABLE
	2	1.6	0.896	.652- 1.16	.714- 1.10	NOT ACCEPTABLE
NITRATE-NITROGEN	1	0.18	0.152	.0788- .234	.0970- .215	ACCEPTABLE
	2	0.81	0.752	.565- .923	.609- .879	ACCEPTABLE
KJELDAHL-NITROGEN	1	3.5	2.20	1.39- 3.14	1.61- 2.92	NOT ACCEPTABLE
	2	8.7	10.5	7.75- 12.7	8.38- 12.1	ACCEPTABLE
TOTAL PHOSPHORUS	1	6.8	7.10	5.57- 8.65	5.95- 8.27	ACCEPTABLE
	2	1.2	1.20	.892- 1.57	.975- 1.49	ACCEPTABLE
DEMANDS IN MILIGRAMS PER LITER:						
COD	1	31	128	99.9- 145.	106.- 140.	NOT ACCEPTABLE
	2	29	30.2	18.1- 39.6	20.9- 36.8	ACCEPTABLE
TOC	1	52	50.5	37.7- 61.9	41.0- 58.6	ACCEPTABLE
	2	12	11.9	7.00- 17.3	8.55- 15.7	ACCEPTABLE
PCBs IN MICROGRAMS PER LITER:						
PCD AROCLOR 1016	2	5.0		D.L.- D.L.	D.L.- D.L.	NOT ACCEPTABLE

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

D.L.

STANDS FOR DETECTION LIMIT

# T A B L E C-3 (Cont'd)

## SUMMARY OF WATER POLLUTION PERFORMANCE EVALUATION STUDIES

### INORGANICS AND ORGANICS \*

PARAMETERS	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE**	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
NUTRIENTS IN MILLIGRAMS PER LITER:						
NITRATE-NITROGEN	1	0.32	0.300	.207- .392	.229- .370	ACCEPTABLE
	2	2.6	2.50	1.93- 3.04	2.06- 2.91	ACCEPTABLE
KJELDAHL-NITROGEN	3	0.50	0.300	D.L.- .803	.0034- .693	ACCEPTABLE
	4	5.2	5.00	3.31- 6.44	3.69- 6.06	ACCEPTABLE
TOTAL PHOSPHORUS	3	0.15	0.100	.0530- .157	.0656- .145	CHECK FOR ERROR
	4	3.3	3.00	2.37- 3.73	2.54- 3.56	ACCEPTABLE
DEMANDS IN MILLIGRAMS PER LITER:						
COD	2	290	238	185.- 272.	196.- 261.	NOT ACCEPTABLE
TOC	1	8.5	8.98	6.01- 12.0	6.82- 11.1	ACCEPTABLE
	2	97	94.2	70.0- 112.	75.6- 107.	ACCEPTABLE
5-DAY BOD	1	80	3.85	1.52- 5.75	2.04- 5.22	NOT ACCEPTABLE
PCBs IN MICROGRAMS PER LITER:						
PCB-AROCLOR 1016	1	5.0	5.72	2.08- 8.68	2.97- 7.80	ACCEPTABLE
PCB-AROCLOR 1254	2	6.1	5.50	2.49- 7.19	3.09- 6.60	ACCEPTABLE
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
1,2 DICHLOROETHANE	1	120	103	71.8- 137.	80.2- 128.	ACCEPTABLE
	2	23	15.5	9.89- 21.6	11.4- 20.1	NOT ACCEPTABLE

- \* WPS-015 11/27/85  
 \*\* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.  
 D.L. STANDS FOR DETECTION LIMIT

T A B L E C-3 (Cont'd)

SUMMARY OF WATER POLLUTION PERFORMANCE EVALUATION STUDIES

ORGANICS \*

PARAMETERS	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE**	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PCBs IN MICROGRAMS PERLITER:						
PCB-AROCLOR 1016	1	2.5		D.L.- D.L.	D.L.- D.L.	NOT ACCEPTABLE
	2	3.1		D.L.- D.L.	D.L.- D.L.	NOT ACCEPTABLE
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
1,2 DICHLOROETHANE	1	30	25.8	17.7- 32.8	19.6- 30.9	ACCEPTABLE
	2	92	77.3	46.6- 108.	54.2- 100.	ACCEPTABLE
CHLOROFORM	1	5.9	6.04	3.27- 8.55	3.95- 7.87	ACCEPTABLE
	2	100	84.5	57.1- 110.	63.8- 103.	ACCEPTABLE
1,1,1 TRICHLOROETHANE	1	15	14.8	10.2- 20.7	11.5- 19.4	ACCEPTABLE
	2	49	44.3	28.0- 62.5	32.3- 58.2	ACCEPTABLE
TRICHLOROETHENE	1	26	22.5	14.0- 30.0	16.0- 27.9	ACCEPTABLE
	2	110	100.2	58.8- 137.	68.5- 127.	ACCEPTABLE
CARBONTETRACHLORIDE	1	22	18.5	11.1- 26.0	13.0- 24.1	ACCEPTABLE
	2	65	52.9	33.0- 76.2	38.4- 70.8	ACCEPTABLE
TETRACHLORDETHENE	1	21	16.9	10.6- 22.5	12.1- 21.0	ACCEPTABLE
	2	100	84.7	51.3- 109.	58.5- 102.	ACCEPTABLE
BROMODICHLOROMETHANE	1	21	15.6	10.8- 21.2	12.1- 19.8	CHECK FOR ERROR
	2	92	65.7	44.4- 92.9	50.5- 86.8	CHECK FOR ERROR
DIBROMOCHLOROMETHANE	1	19	19.1	11.5- 28.9	13.7- 26.7	ACCEPTABLE
	2	110	95.6	64.7- 142.	74.4- 132.	ACCEPTABLE
BROMOFORM	1	70	50.6	28.1- 75.1	34.0- 69.2	CHECK FOR ERROR
	2	46	30.4	14.5- 49.0	18.8- 44.7	CHECK FOR ERROR
METHYLENE CHLORIDE	1	26	20.5	10.8- 30.0	13.2- 27.6	ACCEPTABLE
	2	91	63.8	30.6- 93.0	38.4- 85.2	CHECK FOR ERROR

\* WPS-016 5/23/86

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

D.L. STANDS FOR DETECTION LIMIT

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