

Hydrostratigraphic Database of West-Central Wisconsin



| | |
|----------------------------|---|
| Site: | Junker Landfill |
| Location: | Hudson, St. Croix County, Wisconsin |
| Unit Evaluated: | Ordovician St. Peter, Prairie du Chien |

File includes excerpts from:

Central Wisconsin Engineers, Inc., 1989, Junker Landfill Interim Remedial Option Plan, on file at Wisconsin Department of Natural Resources.

- Boring logs

Wenck Associates, Inc., 1994, Junker Landfill Technical Review and Evaluation, on file at Wisconsin Department of Natural Resources.

- Summary of Facts (e.g. geology and groundwater flow)
- Investigation Chronology
- Site plan

Wenck Associates, Inc., 1995, Final Remedial Investigation Report, Junker Landfill Hudson Township, Wisconsin, on file at Wisconsin Department of Natural Resources.

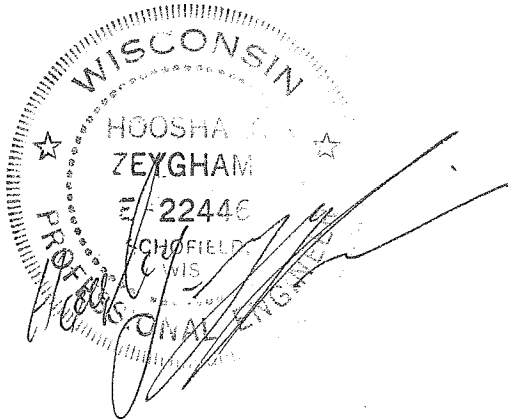
- Complete text section
- Complete tables section
- Complete figures sections (including cross-sections, water table maps, site plans, etc.)
- Slug testing results and analyses (two wells in Prairie du Chien)
- Boring logs
- Geophysical survey results (bedrock surface detail)

Interim Remedial Option

JUNKER LANDFILL CLOSURE PLAN

MARCH, 1989

Project No. 71988



Hooshang Zeyghami, P.E.
Chief Engineer



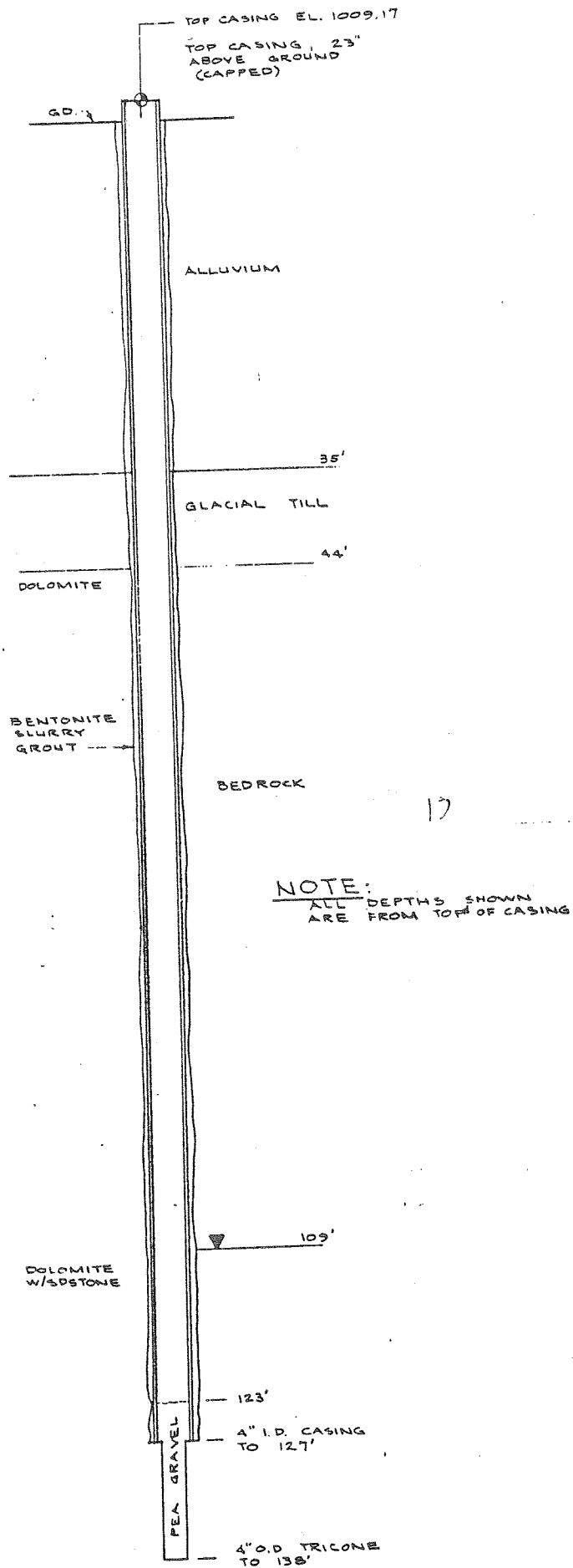
Terry D. Kittson, P.E.
Project Engineer

CENTRAL WISCONSIN ENGINEERS, INC.
903 GRAND AVENUE
ROTHSCHILD, WISCONSIN 54474
TELEPHONE: 715/359-9400

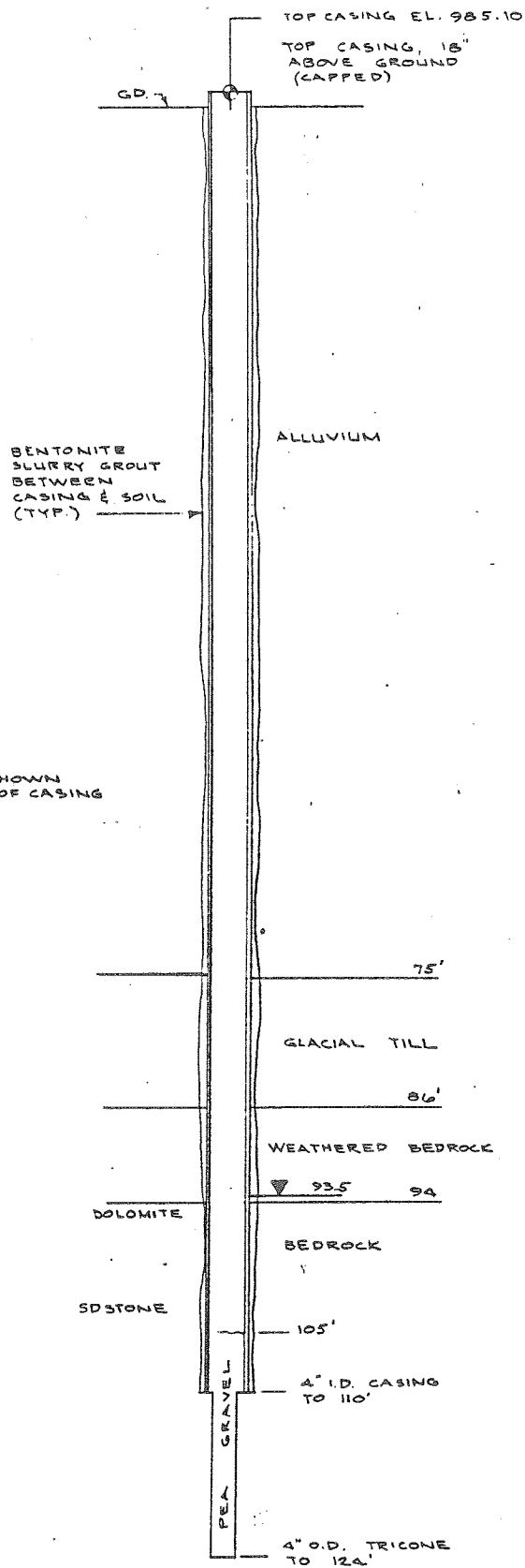
APPENDIX E

WELL CONSTRUCTION REPORTS FOR MW-1 THROUGH MW-6

SOURCE: "Report of Monitoring Well Installation, Junker
Sanitary Landfill, St. Croix County, Wisconsin"
prepared by Ayres Associates, October, 1985.

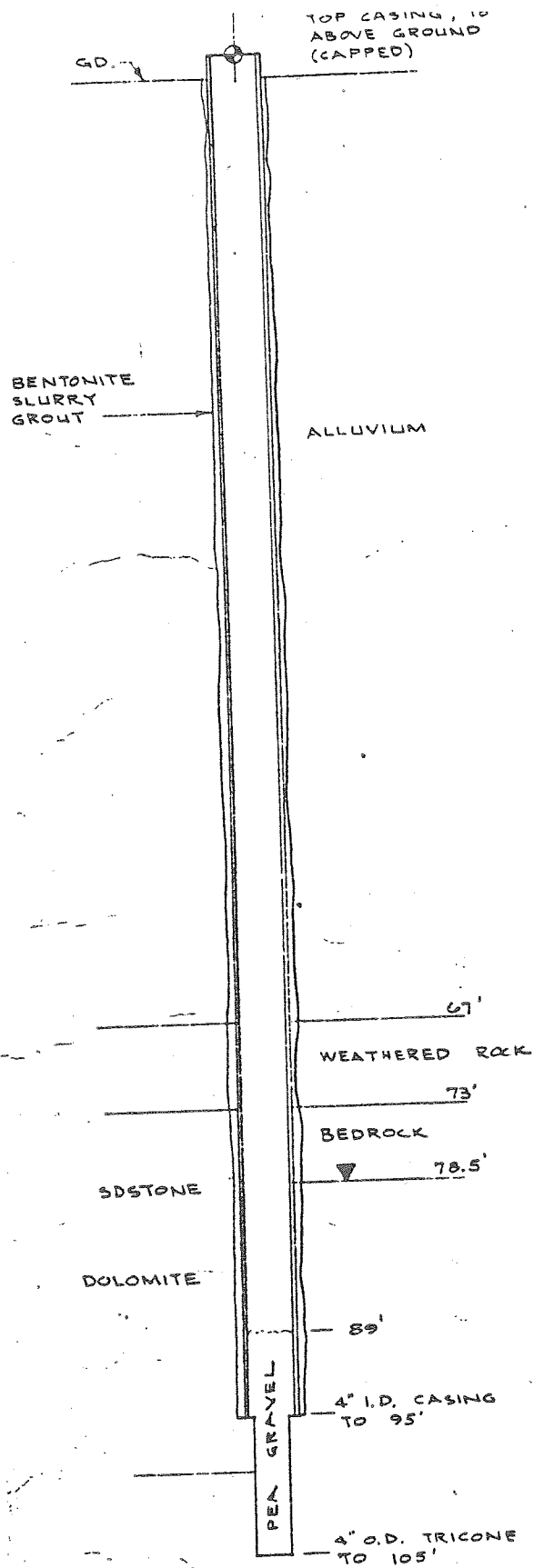


WELL NO. 2



NOTE:
ALL DEPTHS SHOWN
ARE FROM TOP OF CASING

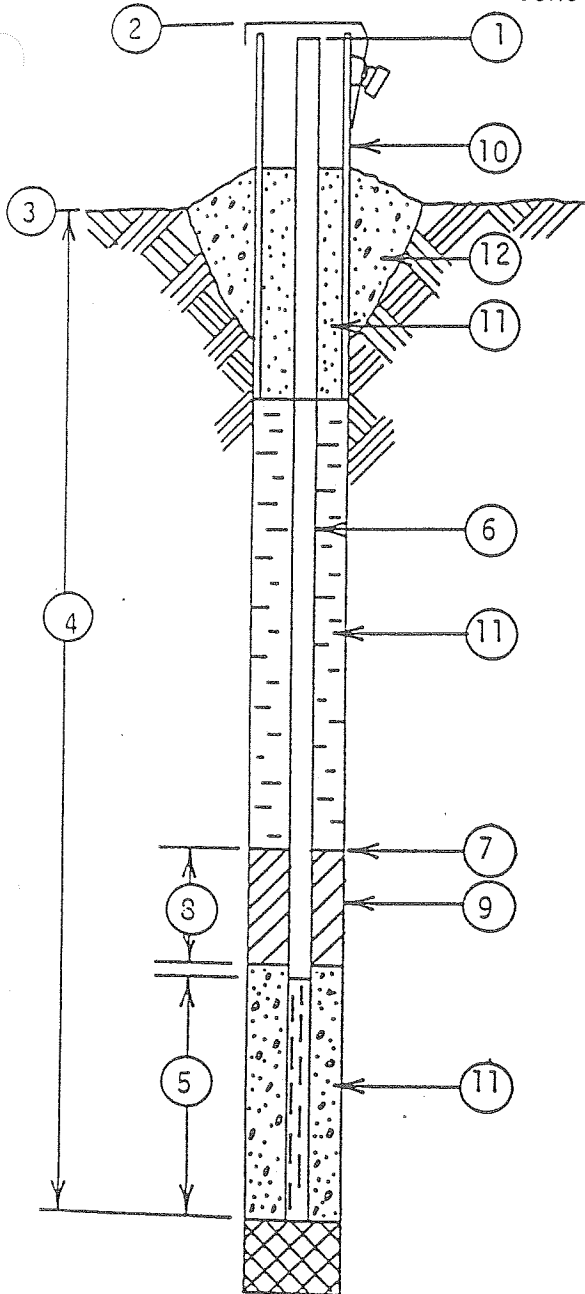
WELL NO. 1



WELL NO. 3

MONITORING WELL W-4

CONSTRUCTION DETAILS



- 1 REFERENCE ELEVATION: 1019.93 FEET
- 2 CAP ELEVATION: 1019.99 FEET
- 3 GROUND SURFACE ELEVATION: 1017.95 FEET
- 4 DEPTH OF WELL FROM GROUND SURFACE: 127 FEET
- 5 LENGTH OF WELL POINT, PVC WELL SCREEN, 0.010" Ø 15 FEET
- 6 SIZE OF PIPE: 2 IN. DIA. THRD. FLSH. JNT.
- 7 ELEVATION OF TOP OF SEAL: 914 FEET
- 8 THICKNESS OF SEAL: 5 FEET
- 9 TYPE OF SEAL: BENTONITE PELLETS
- 10 PROTECTIVE CASING? YES X NO
LOCKING CAP? YES X NO
- 11 TYPE OF BACKFILL:
AROUND SCREEN FLINT SAND
DRILL HOLE CEMENT/BENTONITE GROUT
IN PROTECTIVE TOP GROUT
- 12 CONCRETE CAP? YES X NO

LOCATION 0+40N; 12+00W

JOB NO. 4528.00

DATE July 1-4, 1985

DRILLER M.P.-WI. Test DRLG.

WATER LEVEL CHECKS

From Reference Elevation

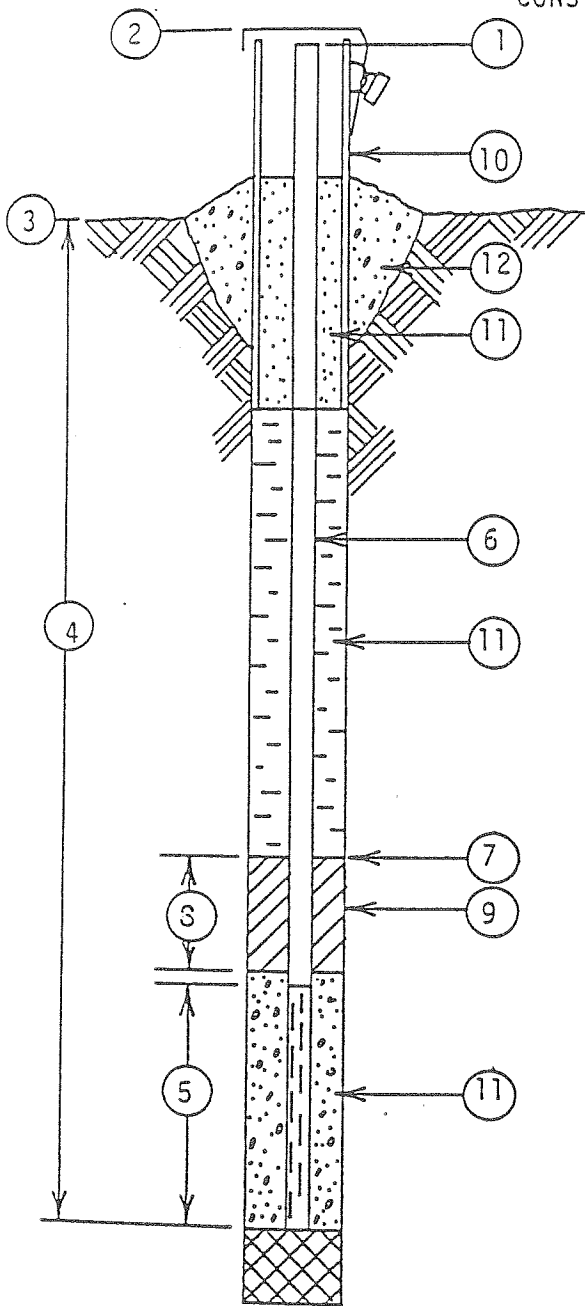
| DATE | TIME | DEPTH TO WATER | WATER ELEVATION | REMARKS |
|---------|-------|----------------|-----------------|---------|
| 7/4/85 | 10 AM | 116.25 | 903.7 | |
| 7/15/85 | | 116.50 | 903.4 | |

AYRES
ASSOCIATES

Engineers
Architects
Planners
Surveyors

W-4

MONITORING WELL W-5
CONSTRUCTION DETAILS



- 1 REFERENCE ELEVATION: 1007.81 FEET
- 2 CAP ELEVATION: 1007.87 FEET
- 3 GROUND SURFACE ELEVATION: 1005.95 FEET
- 4 DEPTH OF WELL FROM GROUND SURFACE: 115.0 FEET
- 5 LENGTH OF ~~XXXXXXXXXX~~ PVC WELL SCREEN, 0.010" ~~XXXXXXXXXX~~ 15 FEET
- 6 SIZE OF PIPE: 2 IN. DIA. THRD. FLSH. JNT.
- 7 ELEVATION OF TOP OF SEAL: 914 FEET
- 8 THICKNESS OF SEAL: 5 FEET
- 9 TYPE OF SEAL: BENTONITE PELLETS
- 10 PROTECTIVE CASING? YES X NO
LOCKING CAP? YES X NO
- 11 TYPE OF BACKFILL:
AROUND SCREEN FLINT SAND
DRILL HOLE CEMENT/BENT. GROUT
IN PROTECTIVE TOP GROUT
- 12 CONCRETE CAP? YES X NO

LOCATION 0+50N; 17+00W (Approx.)

WATER LEVEL CHECKS

JOB NO. 4528.00

From Reference Elevation

DATE July 4-5, 1985

DRILLER M.P.-WI. Test Drlg.

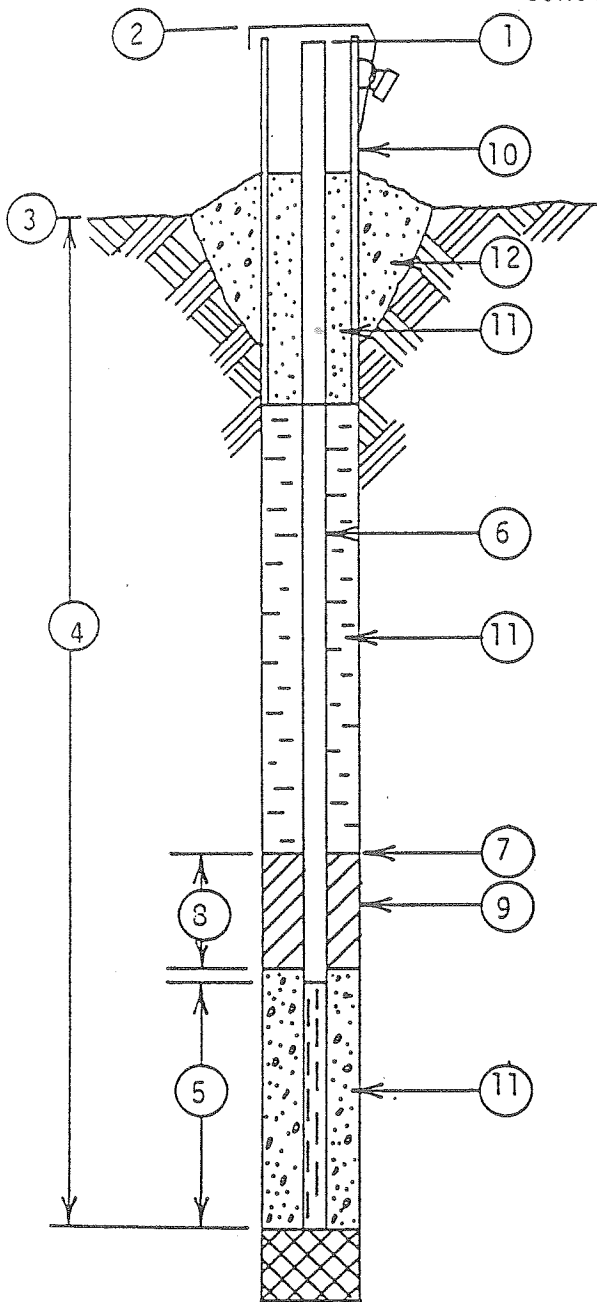
| DATE | TIME | DEPTH TO WATER | WATER ELEVATION | REMARKS |
|---------|----------|----------------|-----------------|---------|
| 7/5/85 | Drilling | 102 | 904.0 | |
| 7/15/85 | | 104.5 | 903.3 | |

AYRES
ASSOCIATES

Engineers
Architects
Planners
Surveyors

W-5

MONITORING WELL W-6
CONSTRUCTION DETAILS



- 1 REFERENCE ELEVATION: 1014.92 FEET
- 2 CAP ELEVATION: 1014.98 FEET
- 3 GROUND SURFACE ELEVATION: 1012.60 FEET
- 4 DEPTH OF WELL FROM GROUND SURFACE: 114.5 FEET
- 5 LENGTH OF ~~XXXXXXXXXX~~ PVC WELL SCREEN, 0.010" ~~XXXXXXXXXX~~ 15 FEET
- 6 SIZE OF PIPE: 2 IN. DIA. Threaded, Flsh Jnt.
- 7 ELEVATION OF TOP OF SEAL: 921 FEET
- 8 THICKNESS OF SEAL: 5 FEET
- 9 TYPE OF SEAL: BENTONITE PELLETS
- 10 PROTECTIVE CASING? YES X NO
LOCKING CAP? YES X NO
- 11 TYPE OF BACKFILL:
AROUND SCREEN FLINT SAND
DRILL HOLE CEMENT/BENT. GROUT
IN PROTECTIVE TOP GROUT
- 12 CONCRETE CAP? YES X NO

LOCATION 7+00N; 15+3-W (Approx)

JOB NO. 4528.00

DATE June 26-28, 1985

DRILLER M.P.-WI. Test Drlg.

WATER LEVEL CHECKS

From Reference Elevation

| DATE | TIME | DEPTH TO WATER | WATER ELEVATION | REMARKS |
|---------|------|----------------|-----------------|---------|
| 7/1/85 | | 112 ft. | 903 | |
| 7/15/85 | | 112 ft. | 903 | |

AYRES
ASSOCIATES

Engineers
Architects
Planners
Surveyors

W-6

Date _____

Other: _____

Junker Landfill Technical Review and Evaluation

Prepared for:

ANDERSEN CORPORATION

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3M

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Wenck File #0289-02

May 1994

JUNKER LANDFILL TECHNICAL REVIEW AND EVALUATION SUMMARY REPORT

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I. INTRODUCTION

Junker Landfill site is located in the township of Hudson in St. Croix County, Wisconsin. The site is located about six miles east of the St. Croix River on Alexander Road, north of U.S. Highway 12. Refer to Figure 1 for the site location.

The Junker Landfill operated from about 1972 to 1987 receiving municipal solid waste, demolition waste and commercial/industrial waste. Closure of the landfill and subsequent post-closure care of the landfill have been undertaken by the Wisconsin Department of Natural Resources (WDNR) as a result of the owner(s)/operator(s) failure to do so. In addition, water quality sampling of residential wells in the area has been undertaken by WDNR and the U.S. Environmental Protection Agency (USEPA). As a result of activities over about the past 10 years, data and technical information have been generated and compiled by the WDNR. A chronology of major activities at the site is presented in Table 1.

The Junker Landfill Technical Review and Evaluation Summary Report is submitted to the WDNR and the USEPA on behalf of Andersen Corporation and 3M. Wenck Associates, Inc. (Wenck) was retained in February 1994, to undertake an evaluation of the technical information and data available regarding the Junker site and provide recommendations for the next logical technical tasks that should be implemented at this site.

There were three main issues addressed by Wenck during the evaluation. These issues were:

- (1) Closure/post-closure of the landfill with regard to effectiveness of source control;
- (2) Groundwater conditions relative to extent and magnitude of contamination from Junker Landfill; and
- (3) Water supply impacts as a result of Junker contamination.

The findings, conclusions and recommendations of Wenck's evaluation are presented herein.

II. SUMMARY OF FACTS

B. GROUNDWATER SITE CONDITIONS

1. Geology – Refer to Figure 5

- Unconsolidated sediments overlying the bedrock are primarily medium- to coarse-grained sand with gravel.
- Silt or clay was reported at thicknesses of 5 to 7 feet overlying the bedrock surface at three locations on the western portion of the landfill.
- The Prairie du Chien Formation (fractured dolomitic limestone bedrock) underlies the unconsolidated sediments.
- Bedrock is reported at depths ranging from 40 to 100 feet below ground surface at the site (Elevation 890 to 963 feet). The Prairie du Chien Formation is reportedly 275-300 feet thick in this area.
- The Prairie du Chien Formation is underlain by the Jordan Sandstone Aquifer.

II. SUMMARY OF FACTS

B. GROUNDWATER SITE CONDITIONS

2. Groundwater Flow – Refer to Figures 5 thru 7.

- Ten monitoring wells have been installed at the site (MW-1 through MW-10).
- MW-1 and MW-2 were abandoned in October 1989.
- All existing well screens intersect the water table except MW-10 which is screened 25 to 30 feet below the water table and is nested with MW-9.
- Groundwater is present at depths ranging from 100 to 115 feet.
- The groundwater table is within the bedrock at the site.
- Regional groundwater flow is generally west towards the St. Croix River.
- Local groundwater flow direction ranges from west to west-northwest based on data collected from site monitor wells, however, some radial flow may be present but is undefined.
- There is a downward vertical hydraulic gradient at the site.
- Roberts Landfill is located about 1 mile hydraulically upgradient.
- The groundwater table is above the bedrock at approximately 2 miles hydraulically downgradient of the Junker Landfill and farther downgradient.

TABLE 1
Chronology of Events

| Date | Activity |
|------------------------------------|--|
| November 1972 | Junker Landfill began operation-owned by Wilfred Pilquist |
| April 1973 | Site purchased by Gary Thompson |
| 1974 | Three monitoring wells installed (MW-1 – MW-3) |
| July 29, 1975 | WDNR License issued for landfill |
| 1976 to Sept. 1986 | Site leased operating rights to Junker Sanitation |
| 1984 | Sampling of wells in Troutbrook area began |
| July 1985 | Three additional monitoring wells installed (MW-4 – MW-6) |
| November 1985 | WDNR published hydrogeological report of Junker site depicting plume |
| 1985 | Remedial activities at Nor-Lake began |
| September 1986 | Site operations returned to Gary Thompson |
| 1987 | Filling activities at Junker Landfill ceased |
| September – October 1989 | Four monitoring wells installed (MW-7 – MW-10) |
| October 1989 | Monitoring well MW-1 and MW-2 abandoned |
| September 1989 – September 1990 | Landfill closure (with passive gas vents) |
| September 1991 | Special Well Construction Area established |
| May – July 1992 | Special Well Construction Area revised |
| June-August 1992 | Active Gas Extraction System installed |
| September 1993 | Began manual pumping of leachate from extraction wells. |
| December 1993 | "Permanent" Leachate Pumping System operational |
| February 1994 | Bottled water delivery program initiated |



Final Remedial Investigation Report

Junker Landfill

Hudson Township,
Wisconsin

*VOLUME I of III
Text, Tables and Figures*

Prepared for

**Junker Landfill
Group**



Wenck

July 1995

Remedial Investigation Report Junker Landfill

HUDSON TOWNSHIP, WISCONSIN

VOLUME I: TEXT, TABLES, & FIGURES

VOLUME II: APPENDICES A THRU E

VOLUME III: APPENDICES F THRU S

Prepared for:

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Prepared by:

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Wenck File #0404-01

April 1995

Revised July 1995

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Acronyms

| | |
|------------------|---|
| A & E | A & E Land Surveying |
| bgl | Below Ground Level |
| cfs | Cubic Feet per Second |
| CH ₄ | Methane |
| cm/s | Centimeters per Second |
| CO ₂ | Carbon Dioxide |
| Comstock & Davis | Comstock and Davis Consulting Engineers & Land Surveyors |
| CWE | Central Wisconsin Engineering |
| DCDFM | Dichlorodifluoromethane (Freon 12) |
| ES | Enforcement Standards |
| Freon-11 | Dichlorodifluoromethane |
| Freon-12 | Trichlorofluoromethane |
| FS | Feasibility Study |
| ft/day | Feet per Day |
| GEW- <i>n</i> | Gas Extraction Wells |
| gpm | Gallons per Minute |
| Group | Junker Landfill Group |
| head | Depth to Groundwater Measurements and Groundwater Elevations |
| HELP | Hydrologic Evaluation of Landfill Performance |
| HES | Hazleton, Environmental Services, Inc. |
| LEL | Lower Explosive Limit |
| meq/l | Milliequivalent per Liter |
| mgd | Million Gallons per Day |
| NGVD | National Geodetic Vertical Datum |
| O ₂ | Oxygen |
| PAL | Preventative Action Limit |
| PCBs | Polychlorinated Bi-Phenyls |
| PCE | Tetrachloroethene |
| ppbv | Parts per Billion Volumetric |
| QA/QC | Quality assurance/quality control |
| QAPP | Quality Assurance Project Plan |
| RI | Remedial Investigation |
| SVOCs | Semi-Volatile Organic Compounds |
| SWCA | Special Well Construction Area |
| TCE | Trichloroethene |
| TCFM | Trichlorofluoromethane (Freon 11) |
| THF | Tetrahydrofuran |
| VOCs | Volatile Organic Compounds |
| WB- <i>n</i> | Soil Borings Identifier Number |
| WDH | Wisconsin Division of Health |
| WDNR | Wisconsin Department of Natural Resources |
| Wenck | Wenck Associates, Inc. |
| WW- <i>n</i> | Monitoring well |
| Work Plan | Remedial Investigation Work Plans, Junker Landfill, Hudson, Wisconsin, December 1994, Revised January 1995" |

EXECUTIVE SUMMARY

The Junker Landfill is located in Hudson Township in St. Croix County, six miles east of Hudson. The 20-acre landfill was operated between 1972 and 1987, and contains an estimated 1.25 million compacted cubic yards of waste. The landfill received municipal and industrial/commercial wastes. In the mid-1980s, groundwater monitoring by the Wisconsin Department of Natural Resources (WDNR) revealed concentrations of chlorinated solvents in the landfill vicinity. The part-per-billion-range concentrations indicated a plume extending approximately two miles downgradient from the near-landfill area. The WDNR undertook closure of the landfill in 1987 as a result of the landfill owner's failure to do so. In 1989-1990 a 2-foot thick clay cap with a passive gas collection system was installed over the waste to minimize infiltration of precipitation and prevent landfill gas build-up. An active gas extraction flare system was installed in 1992 to control and destroy landfill gas. Post-closure care of the landfill has been ongoing since the early 1990s.

A group of former landfill customers was formed in 1994 to begin providing bottled water to area residences and to study the environmental issues related to the site. The group retained Wenck Associates, Inc. of Maple Plain, Minnesota, to conduct a remedial investigation (RI) of the extent and magnitude of impacts associated with the landfill. Wenck prepared a work plan detailing the objectives and procedures for conducting the RI consistent with the United States Environmental Protection Agency's (USEPA) National Contingency Plan. The work plan was formally approved by the WDNR in February 1995; however, WDNR provided verbal approval to conduct certain tasks in December 1994 to avoid cold weather problems. Wenck conducted the data collection portion of the project between December 1994 and March 1995. This report presents the findings of the RI.

The physical condition of the landfill was investigated as part of the RI, revealing that there is an area of uncapped waste of about 0.2 acres on the north side of the landfill. The existing landfill clay cap was found to be in good condition, preventing over 99 percent of precipitation from infiltrating into the waste. However, a pool of free leachate in the amount of 3.5 to 7 million gallons was found in the southeast corner of the waste mass. There appears to be a subsurface water source outside the cap area, such as infiltration from drainage ditches, which is maintaining the pool of leachate at the current levels. Four leachate pumping tests conducted as part of the RI determined that the waste mass yields low leachate pumping rates.

Samples of the landfill leachate revealed low or non-detectable concentrations of the compounds associated with the groundwater contamination. In particular, trichloroethene (TCE), the compound of primary concern in the groundwater, has not been detected in the leachate above the groundwater enforcement standard. Compounds with high concentrations in the leachate, such as tetrahydrofuran, were not detected in the groundwater. Based on both organic and inorganic chemical data, leachate from the landfill does not significantly impact groundwater quality. The physical presence of leachate in the landfill however, can promote the generation of landfill gas. Analysis of the landfill gas prior to flaring, however, revealed high concentrations of the compounds of concern. Nearly 4,000 pounds of volatile organic compounds (including 44 pounds of TCE) were removed from the landfill in 1994 via the landfill gas extraction system. A performance evaluation of that system showed that the emissions from the flare were from two to six orders of magnitude below maximum allowable levels.

The gas extraction system's ability to capture all of the subsurface landfill gas was found to be deficient; gas migrates from the landfill to the south. Prior to the investigation, in-home methane monitors were installed in four homes (one home has one which was previously installed by the WDNR) in the area of gas migration as a precautionary measure. Subsurface geologic features appear to cause the gas to migrate preferentially

to the south at depth. The homes located one-quarter mile south of the landfill do not appear to be at risk as the gas concentrations detected nearby were 55 feet below grade.

The hydrogeologic and chemical conditions of the groundwater in the study area were also investigated as part of the RI. The water table beneath the area was found to be present in the bedrock (the Prairie du Chien Aquifer) at a depth of about 100 feet. Groundwater flow was determined to be toward the Willow River, west-northwest of the landfill at an estimated mean velocity of 850 feet per year. Sampling revealed that TCE is present in the groundwater above the WDNR enforcement standard. TCE is a common cleaning agent and degreasing solvent. The highest concentrations of TCE in the groundwater are found $\frac{1}{4}$ mile south of the landfill, not directly beneath the landfill as would be typically expected. The major source of TCE in the groundwater is evidently the result of migrating landfill gas; TCE may dissolve directly into the groundwater from the gas, or naturally infiltrating water south of the landfill may dissolve the TCE and carry it to the water table.

The groundwater sampling also revealed that the TCE plume has changed very little during the past 10 years. In order for the plume to persist in this almost stationary condition, TCE in the groundwater must be subject to biodegradation, volatilization, or other "loss mechanisms".

Most of the homes in the area have wells screened in the Prairie du Chien Aquifer. The private wells screened in the underlying Jordan Aquifer are not contaminated. Fifteen private wells in the Prairie du Chien were found to have TCE concentrations exceeding the enforcement standard of 5 micrograms per liter ($\mu\text{g/l}$). The most downgradient of these wells are located along LaBarge Road, about 1.5 miles west-northwest of the landfill. Historically, seven additional wells had TCE enforcement standard exceedances; of these seven, five no longer exceed the enforcement standard, and two have been replaced by Jordan wells. Currently, in addition to the 15 private wells exceeding the enforcement standard, 29 private wells exceed the TCE preventive action

limit of 0.5 µg/l. Low-level detections of TCE, approximately 2-4 µg/l, were found in the Bakken Road area and sporadic detections of less than 1 µg/l extend to County Road A. An estimated 120 pounds (or about 10 gallons) of TCE are present in the groundwater beneath the study area.

Tetrachloroethene, freon-11 and freon-12 were also sporadically detected in the groundwater, but at concentrations below their respective enforcement standards. Twelve private wells had tetrachloroethene concentrations exceeding the preventative action limit of 0.5 µg/l. None of the freon-11 or freon-12 detections were above their respective preventative action limits.

Semi-volatile organics, pesticides/PCBs and metals analyzed for during the RI were found not to be of concern at this site.

The objectives set forth in the approved work plan were accomplished during the RI and the subsequent analysis of the information gathered. The facts and interpretations presented in this report will form the foundation of the forthcoming feasibility study. The feasibility study will focus on the various techniques which can be used to remedy or guard against any environmental problems.

SECTION 1 - INTRODUCTION

1.1. PURPOSE

The Junker Landfill Group, composed of a number of former customers of the landfill, retained Wenck Associates, Inc. in February 1994 to evaluate existing technical information about the Junker Landfill. As part of that evaluation, Wenck recommended that additional information be collected to fill data gaps to quantify the extent and magnitude of environmental impacts associated with the landfill. In a letter dated November 28, 1994, from the Group to the Wisconsin Department of Natural Resources (WDNR), the Group committed to conduct a "remedial investigation" (RI) under the review of the WDNR.

Wenck, on behalf of the Group, set forth the strategy for an RI consistent with the National Contingency Plan, 40 CFR, Part 300, in the document "Remedial Investigation Work Plans, Junker Landfill, Hudson, Wisconsin, December 1994, Revised January 1995" (Work Plan). The Work Plan was formally approved by the WDNR on February 6, 1995; however, the WDNR provided verbal approval of some aspects of the Work Plan in order for the RI to proceed in December 1994 to avoid severe cold-weather problems. The field portion of the RI was completed between December 1994 and March 1995, and this report details the RI procedures and findings. The data and conclusions presented in this report form the basis for screening remedial alternatives in the forthcoming "feasibility study" (FS). This RI report was prepared in accordance with the National Contingency Plan, 40 CFR, Part 300.

1.2. STUDY AREA BACKGROUND

1.2.1. Study Area Description and Physical Setting

A brief discussion of the study area's physical setting is given below. A detailed discussion, including RI results, is presented in Section 3. "Study Area" refers to the entire area of the remedial investigation, which includes the landfill property and areas surrounding the landfill within the Special Well Construction Area (SWCA) extending west to County Road A (see Figure 1-1).

The Junker Landfill is located in Hudson Township, St. Croix County, Wisconsin [Section 13, Township 29 N, Range 19 W], on Alexander Road north of U.S. Highway 12, about 6 miles east of the City of Hudson. Access to the landfill is controlled through a locked gate. The property has a 6-foot chain link fence with barbed wire, with signs posted on the southwest side of the landfill.

The landfill is bordered on the west and south by Alexander Road, on the east by a residential farmstead, and on the north by undeveloped, wooded property owned and operated by the Girl Scouts. The Girl Scouts operate a retreat camp used by approximately 3,500 girls and 1,000 adults per year; this camp is maintained by a caretaker who lives there permanently. The Chicago and North Western Railroad runs parallel to Alexander Road along its southwest side. Land use across the study area is primarily rural residential and agricultural. The area is sparsely populated, with a housing density of roughly one home per 20 acres.

The study area lies in the St. Croix River basin and is characterized by rolling hills and a hummocky terrain. The shallow geology is comprised of glacial drift, which in turn is underlain by carbonate bedrock (the Prairie du Chien Formation). The water table lies in the upper portion of the bedrock. The discharge points for near-surface groundwater flow beneath the study area are the Willow River (some 5 miles northeast of the study area) and the St. Croix River (approximately 7 miles west of the study area).

On average, approximately 32 inches per year of precipitation fall at the study area. Of this amount, roughly 6 inches seeps into the ground (in areas other than the capped landfill itself); 6 inches runs off over the ground surface (ultimately to the St. Croix River); and 20 inches is used by plants or evaporated (Young, 1973).

1.2.2. Site History

The Junker Landfill property was a sand and gravel quarry until 1972. The site operated as a landfill from 1972 to 1987. The landfill began operation in November 1972 under the ownership of Wilfred Pilquist. The site was purchased in April 1973 by Gary Thompson and

was operated by him until 1977 under the name Landfill Land Company. In 1977 Junker Sanitation, Inc. leased the landfill and operated it until January 1987. Mr. Thompson reopened the site for about one month in mid 1987 until the WDNR shut down the operation. The landfill has been inactive since mid 1987.

The area of waste fills approximately 20 acres with the estimated volume of waste being 1,000,000 - 1,250,000 cubic yards. The landfill received municipal solid waste, sewage sludges, demolition waste and various commercial/industrial trash and wastes. There is no documentation of how or where the types of wastes were filled at the site. However, it is known that the landfill was filled from north to south.

Closure of the landfill and its subsequent post-closure care were undertaken by the WDNR beginning in 1987 as a result of the owners' failure to do so (the Junker Landfill Group assumed the landfill's post-closure care in March 1995). In 1989/1990 a 2-foot clay cap over the site with a passive gas system was installed. An active gas system was retroactively installed in 1992 due to indications of off-site gas migration. The extracted landfill gas is flared on-site. Post-closure care has consisted of maintaining the gas extraction system, monitoring gas pressures and concentrations in the soil, monitoring leachate levels, sporadically pumping leachate, and sampling of on-site wells.

Dating back to 1984, the WDNR conducted sampling of private wells in the area. Volatile organic contamination (mainly trichloroethene) was found in private wells in Hudson Township. In 1991, the WDNR established a SWCA and revised it in 1992 to control private well construction in the area. The SWCA boundary near the landfill is shown on Figure 1-2.

In January 1994, the Group formed and initiated a bottled water delivery program to those residents in the SWCA wanting to participate. Since October 1994, the Group has been providing bottled water to 58 residences east of County Road A in the SWCA who have requested it under the program. The homes receiving bottled water are shown on Figure 1-2.

A summary of the chronology of major historical events regarding the Junker Landfill is presented below. A discussion of activities leading up to conducting the RI is presented after the chronological summary.

| Date | Activity |
|---------------------------------|--|
| November 1972 | Junker Landfill began operation; owned by Wilfred Pilquist |
| April 1973 | Site purchased by Gary Thompson |
| 1974 | Three monitoring wells installed (MW-1 -- MW-3) |
| July 29, 1975 | WDNR license issued for landfill |
| 1976 - September 1986 | Operating rights leased to Junker Sanitation |
| 1984 | Well sampling in Troutbrook area began |
| July 1985 | Three additional monitoring wells installed (MW-4 -- MW-6) |
| November 1985 | WDNR published hydrogeological report of Junker site depicting plume of groundwater contamination |
| September 1986 | Site operation returned to Gary Thompson |
| 1987 | Filling activities at Junker Landfill ceased |
| September - October 1989 | Four monitoring wells installed (MW-7 -- MW-10) |
| October 1989 | Monitoring wells MW-1 and MW-2 abandoned |
| September 1989 - September 1990 | Landfill closed (capped and passive gas vents installed) |
| September 1991 | Special Well Construction Area established |
| May - July 1992 | Special Well Construction Area revised |
| June - August 1992 | Active Gas Extraction System installed |
| September 1993 | Manual pumping of leachate from extraction wells began |
| December 1993 | "Permanent" Leachate Pumping System operational |
| December 1993 | USEPA sent interoffice letter regarding potential ecological risks associated with Junker Landfill |
| January 1994 | Wisconsin Dept. of Health issued Health Consultation Report |
| February 1994 | USEPA/WDNR site assessment/residential sampling event conducted (report published 4/94) |
| February 1994 | Bottled water delivery program initiated |
| May 1994 | Wenck published "Junker Landfill Technical Review and Evaluation, Summary Report" |
| July 1994 | "Residential Well Sampling Work Plan" submitted to WDNR by Wenck |
| August - September 1994 | Completion of Comprehensive Residential Well Sampling event |
| October 1994 | Submittal of "Residential Well Sampling Report" by Wenck |
| November 28, 1994 | Letter of Intent submitted by Junker Landfill Group to WDNR |
| December 1994 | "Remedial Investigation Work Plans" Submitted to WDNR by Wenck" |
| January 1995 | Revised Work Plans submitted to WDNR reflecting WDNR's comments |
| January 10, 1995 | Public meeting held by Group regarding RI activities |
| February 6, 1995 | WDNR grants formal approval of Work Plans |
| March 1, 1995 | Group formally assumes post-closure activities |
| December 1994 - March 1995 | Field portion of the RI completed |

1.2.3. Summary of Previous Investigations

As a result of many activities over about the past 10 years, technical information and data have been generated by the WDNR and WDNR contractors. Many reports by various authors have been published containing information germane to the RI. These reports are listed below: [The reports that were reviewed and relied upon in the analysis are too voluminous to append to this report, however, the reports are on file with the WDNR.]

- Report and Operational Plan (7/75) by Landfill Land Company.
- Junker Landfill Focused Remedial Option Plan (4/89) by Central Wisconsin Engineering (CWE).
- Clay Source for Junker Landfill Remedial Action Project (6/89) by CWE.
- Specifications for Junker Landfill Remedial Action Project (7/89) by CWE.
- Junker Landfill No. 1972, Town of Hudson, St. Croix County, Wisconsin, Well Construction Report (1/90) by CWE.
- Construction Documentation for Junker Landfill Remedial Action Project (12/90) by CWE.
- In-Field Conditions Report, Trout Brook Road/Parkview Estates Area (4/92) by Braun Intertech.
- Critical Analysis of Braun Report Concerning VOC Contamination in the Green Mill Lane/Trout Brook Road/Parkview Estates Area (6/92) by Ayres.
- Groundwater and Gas Monitoring Report to WDNR for Junker Landfill (1/93) by CWE.

- Junker Landfill, Hudson, Wisconsin, Potential Ecological Risks (12/93) Interoffice Letter by USEPA Region V.
- SACM Health Consultation (1/94) Report by Wisconsin Department of Health to USEPA Region V.
- Site Assessment Report for Junker Landfill (4/94) by USEPA.

On behalf of the Group, Wenck was retained to review the historical information which included the above reports. The findings of Wenck's review were summarized in the report, "Technical Review and Evaluation, Summary Report" of May 1994. Based upon the review and evaluation of approximately 10 years of on-site and off-site data, three main issues of environmental concern were identified in the technical review: (1) closure/post-closure issues in regards to the effectiveness of contaminant source control; (2) groundwater conditions relative to the extent and magnitude of landfill-related impacts; and (3) impacts to residential water supplies.

As part of the May 1994 report, Wenck recommended the next logical steps to be taken at the study area with regard to three main issues identified. One of these steps included a comprehensive VOC residential well sampling event east of County Road A. At the request of the WDNR, Wenck, on behalf of the Group, sampled 71 residential wells in August/September 1994 and documented the findings in the "Residential Well Sampling Report, Hudson, Wisconsin" of October 1994. The report concluded that:

- trichloroethene and tetrachloroethane were the main VOCs of concern;
- 44 wells showed detectable levels, but only 14 exceeded WDNR enforcement standards; and
- all Jordan bedrock wells tested were clean indicating that this underlying aquifer was not impacted.

Supplemental to these recent evaluations completed by Wenck, a consultant retained by the WDNR conducted an evaluation of the landfill's gas management system operation and maintenance in September 1994. The findings are detailed in "Report of Evaluation and Oversight of Operation and Maintenance at the Junker Landfill," prepared by Gas Control Engineering in October 1994.

The recommendations from May 1994 Wenck report, the findings of the comprehensive residential well sampling, published by Wenck in October 1994, and the findings presented by Gas Control Engineering in their report in October 1994 form the basis of the objectives of the RI and the activities conducted.

1.3. PROJECT OBJECTIVES

Presented below are specific project objectives that were presented in the approved Work Plan and the activities that were completed to fulfill them. These objectives were undertaken to fill existing data gaps and refine understanding of the study area's environmental setting.

| <u>Objective/Data Gap</u> | <u>Investigation Activity</u> |
|---------------------------|-------------------------------|
|---------------------------|-------------------------------|

| | |
|-------------|--|
| I. LANDFILL | |
|-------------|--|

| | |
|-------------------|--|
| A. Cap Evaluation | |
|-------------------|--|

| | |
|--------------------------|---|
| 1. Evaluate clay barrier | 18 in-place density tests performed. 5 permeability tests performed. 5 Atterberg Limits tests performed. 5 particle size distribution tests performed. |
|--------------------------|---|

| | |
|-----------------------------|--|
| 2. Evaluate cap cover soils | 5 permeability tests performed. 5 soil classification tests performed. 5 particle size distribution tests performed. |
|-----------------------------|--|

| | |
|---------------------------------------|--------------------------------|
| 3. Evaluate limits of uncapped wastes | 10 trenches and test pits dug. |
|---------------------------------------|--------------------------------|

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Objective/Data Gap

Investigation Activity

B. Leachate Management

- | | |
|---------------------------------------|---|
| 1. Evaluate leachate quality | 5 leachate samples collected and analyzed. |
| 2. Evaluate leachate quantities | Conducted comprehensive leachate head and thickness survey. |
| 3. Evaluate leachate generation rates | Analyzed soil testing data and apply HELP model. |
| 4. Evaluate leachate recoverability | Leachate pumping tests conducted at GEW-7, GEW-8, GEW-9, and LHW-1. |

C. Gas Migration

- | | |
|---|---|
| 1. Determine effectiveness of gas extraction system | Monitored in-waste gas pressure using geo-probes to determine radius of influence at GEW-8 and GEW-9. Monitored existing gas probes. |
| 2. Define flare destruction | Calculated percent destruction efficiency. |
| 3. Define geologic barriers to gas migration | Drilled three soil borings into bedrock. Devised two geologic cross-sections. |
| 4. Define off-site gas migration | Conducted soil gas survey outside waste using 14 geoprobes. Monitored 7 existing gas monitoring wells. |
| 5. Protect homeowners from gas migration | Installed four additional in-home methane monitors. |

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Objective/Data Gap

Investigation Activity

II. GROUNDWATER

A. Geology

- | | |
|------------------------|--|
| 1. Geophysical Survey | Conducted refractive seismic surveys along LaBarge and Bakken Roads. |
| 2. Well Log Review | Compiled summary of existing residential and monitoring well logs across study area. |
| 3. Soil Boring Program | Drilled borings WB-1 thru WB-3. |

B. Hydrogeology

- | | |
|---------------------------------|--|
| 1. Monitoring Well Installation | Constructed Monitoring wells WW-11 thru WW-16. |
| 2. Horizontal Groundwater Flow | Conducted comprehensive depth to ground-water surveys. Performed literature review of hydraulic characteristics of Prairie du Chien. Slug tested WW-12 and WW-15A. |
| 3. Vertical Groundwater Flow | Conducted Depth to groundwater measurements at WW-15A thru WW-15C. Performed literature review on Prairie du Chien/Jordan Aquifer. |

C. Groundwater Quality

- | | |
|---|--|
| 1. Define Plume Extent and Characterization | Conducted two rounds of sampling and analysis at: <ul style="list-style-type: none">- 14 residential wells- 21 monitoring wells Used findings from groundwater flow analysis. |
| 2. Evaluate Potential for Cross Contamination | Collected and analyzed samples from well nest WW-15A thru WW-15C. Reviewed residential well logs. Reviewed Jordan water quality results. Performed depth for groundwater measurements at WW-15A thru WW-15C. Performed literature review on Prairie du Chien/Jordan Aquifer. |

1.4. REPORT FORMAT

Section 2 of this report documents the details of the specific activities performed during the remedial investigation and changes from the Work Plan dictated by field conditions. Section 3 refines previous interpretations on the physical characteristics of the study area using new findings from the RI. Section 4 details the nature and extent of contamination associated with the landfill. Section 5 describes the fate and transport of contaminants. Section 6 presents a summary of the findings and conclusions drawn.

SECTION 2 - STUDY AREA INVESTIGATIONS

The RI consisted of surveying and mapping, investigating the environmental concerns associated with the landfill, and the character, extent, magnitude and fate of environmental impacts. The field activities for each of these efforts are detailed in the following subsections. These field activities were based on the Work Plan that Wenck prepared as a precursor to the investigation. The strategy and protocol for field work set forth in the Work Plan were followed, but in some instances field conditions warranted minor variations, the reasons for which are included at the end of this section.

2.1. ACCESS AND AUTHORIZATION

Preceding RI field activities, the vertical and horizontal locations, plans, and specifications for all proposed wells were submitted to the WDNR for approval as part of the Work Plan and as required specifically for monitoring wells under Wisconsin Administrative Code NR-141.065 "Well Location." Property access at the proposed work locations was acquired prior to proceeding with the field work. Cherl, Inc., as the landfill property owner of record, was contacted via certified letter to Mr. John Sauer, dated November 22, 1995, to request formal access to the landfill. The certified letter was returned unclaimed. WDNR was then requested to provide access under their statutory authority. Table 2-1 presents the landowners that provided access for the various activities. After a soil boring or well location was agreed upon with the landowner, and prior to start of drilling, the location was cleared for utilities and surveyed.

2.2. SURVEYING AND MAPPING

To compliment previous topographic mapping, which did not encompass the entire area of the proposed landfill investigation activities, or establish regional orientation, an aerial topographic map of the area about 1,000 feet surrounding the landfill was developed. The survey flight to map the area was done in November 1994 by Markhurd Photogrammetric Engineers of Maple

Grove, Minnesota. The map developed from the survey flight contains the planimetric features of the area as well as topography at a contour interval of 2 feet, and is presented as Figure 2-1.

The topographic map was oriented horizontally on the Wisconsin State Plane coordinate system (1927 datum) and vertically on the National Geodetic Vertical Datum (NGVD) of 1929 by Comstock and Davis Consulting Engineers & Land Surveyors (Comstock & Davis) of Lake Elmo, Minnesota. Comstock & Davis set two horizontal control points on the southern edge of the landfill along the fill area and checked a vertical control point on the first telephone pole near the southern gate of the landfill entrance. A & E Land Surveying (A & E) of New Richmond, Wisconsin checked these control points for accuracy shortly after they were set and used them to establish two benchmarks for horizontal and vertical control (Wenck BM1 and Wenck TBM1) outside of the fill area on the west side of the landfill. Wenck TBM1 is to be made into a permanent monument in the Spring of 1995 as ground conditions permit. The locations where trenching and sampling were performed, the locations for all of the wells in the monitoring network and other RI work have been surveyed relative to these landfill benchmarks and to a brass cap in the Highway 12 railroad bridge southeast of the landfill. The brass cap is a vertical control point which has been verified by A & E to be accurate to NGVD of 1929, also.

The horizontal locations were established with first order accuracy (0.1 foot over the study area) and the vertical locations were established with third order accuracy (0.01 foot over the study area). Appendix A provides a summary of the survey data.

2.3. LANDFILL CAP INVESTIGATION

The primary function of a landfill cap is to prevent precipitation from infiltrating through the refuse in the landfill, thereby minimizing the amount of leachate generated. Wenck evaluated the existing condition of the cap via visual examination and through a series of field and laboratory tests. The purpose of the evaluations was to determine the following:

- Permeability of the clay barrier layer and whether it has increased over time, possibly due to freeze/thaw or desiccation.
- Material classification of the soil layer directly above the clay barrier layer.
- Soil classification information for a water balance model which is used to better determine leachate generation rates.
- Settlement areas of the landfill cap which may not drain.
- Feasibility of leachate extraction.

2.3.1. Walk-Through Inspection

As discussed in Section 2.1, an aerial topographic map of the landfill and surrounding area was developed. This map was compared to the current as-built map for the landfill to determine areas of settlement or any other changes to the grades that may affect the performance of the landfill cover. Areas that indicated potential settlement and needed verification to a greater accuracy than a 2-foot contour interval were surveyed.

In addition, Wenck personnel walked through the area to inspect the condition of the existing cover and review the designated locations for surface soil sampling. Any areas of drainage, deterioration, excessive settlement, stressed vegetation, and leachate seeps were noted in a field book. Figure 2-2 presents features of the landfill.

Subsequent to the winter RI a spring walk-through inspection was performed. Wenck personnel inspected the landfill with the WDNR in May 1995 regarding the integrity of the landfill cap and general site conditions under non-frozen conditions.

2.3.2. Clay Barrier

2.3.2.1. Testing Requirements and Sampling Locations

Soil testing results for the samples taken from the 2-foot clay barrier layer are detailed in Table 2-2. A total of five samples of the clay barrier layer were collected by Wenck and tested by Soil Engineering and Testing of Bloomington, Minnesota, for permeability, Atterberg limits, and particle size distribution. Sampling locations were distributed across the study area, and were selected to be representative of the clay barrier layer and settlement areas. In addition, 18 density tests were performed in the field at the locations shown on Figure 2-3. Samples were labeled in accordance with the numbering and grid coordinate system provided on Figure 2-3. Sample locations were established by surveying prior to collection.

Permeability, Atterberg limits, and particle size distribution analysis were performed on 5 samples obtained at the frequency of one test per 4 acres. Refer to the Work Plan for the ASTM methods D5084, D4318, D421 and D422, respectively, which were used for analysis of the samples

Nuclear density tests were performed at 18 undisturbed sample locations to a depth of 1 foot below the clay surface at a frequency of one test per acre to measure dry density of the cap material (testing was not performed at two of the 20 proposed locations due to excessive moisture conditions). The nuclear density gauge was standardized at the start of each day and was calibrated in a typical test pit. Four of the density tests were performed at the same locations (+ or - 2 feet) as the permeability sampling, while the 14 additional tests were completed at the locations shown on Figure 2-3. The samples were tested in the field in accordance with ASTM D2922 (refer to the Work Plan). Sample locations were surveyed prior to collection. Density test location D3 was relocated and resurveyed approximately 25 feet southwest of its original proposed location so that it was not on the north slope of the landfill.

2.3.2.2. Procedures

A small rubber-tired backhoe was used to assist in sample collection while keeping disturbance to the cover system at a minimum. The backhoe bucket used was toothless to minimize disturbance to the clay barrier layer. An excavation area of approximately 4 feet by 4 feet was advanced down to the clay surface to allow for proper sample collection. Following completion of sample collection, the backhoe backfilled the excavation with cover soil and topsoils and restored the area to original grades. Seeding will be completed in the spring of 1995 using seed similar to surrounding vegetative growth.

All clay permeability samples were taken with a 3-inch diameter, 2-foot long thin-walled Shelby tube sampler, such that the sample tube was inserted into the clay perpendicular to the plane of the soil surface. The tube was pushed by the backhoe bucket to a depth of 18 inches to sample the middle of the 2-foot thick clay barrier layer. The sample tube was rotated 180° prior to being extracted perpendicular to the plane of the soil surface by a chain attached to the backhoe bucket. A removable steel top mount on the Shelby tube was used to allow the tube to be inserted and extracted by the backhoe bucket and rotated at 180° with a wrench.

Compression fittings were placed against the ends of each soil sample in the Shelby tube to keep the clay sample from being disturbed during transport to the laboratory. The ends were capped and sealed with duct tape. The samples were submitted to the laboratory directly by Wenck and extracted for permeability testing within 24 hours of sample collection.

Permanent marker on the outside of the Shelby tube designated the sample interval with top and bottom designations to ensure that the tubes remained in the upright position during transport to the lab. The sample identification, date, job description, and sampling personnel identification were also included on the outside of the tube. All samples were logged on a chain-of-custody form which included the sample identification, date, time, analytical requirements, job description, sampling personnel identification, and the record names, dates and times of relinquishment of the samples from the time they were taken until they were relinquished to the lab. Geotechnical chain-of-custody forms and reports of the geotechnical analyses are given in Appendix B.

Nuclear density methods were used for the density testing due to the ease of testing and the relatively large number of tests which could be run in a given period of time. Dry density results from the nuclear density testing during construction of the clay barrier layer were compared. Perforations and voids in the clay created by the nuclear density probe and permeability sampling tubes were filled with a powdered soil-bentonite mixture. The mixture was compacted in-place with a hand tamper to establish original grades.

All testing and sampling procedures for the clay barrier were performed in accordance with the Work Plan.

2.3.3. Cover Soils

2.3.3.1. Testing Requirements and Sampling Locations

Testing results for the 2 feet of cover soil are detailed in Table 2-2. Five samples were collected by Wenck and tested by Soil Engineering and Testing for permeability, soil classification, and particle size distribution. Sample collection locations are shown on Figure 2-3 and are the same five locations for sampling the clay barrier layer. As stated in the previous section on testing the clay barrier layer, an attempt was made to distribute the sampling locations for the cover soil across the study area to take into account various cap conditions. The sampling locations shown on Figure 2-3 were surveyed by A & E and staked prior to sample collection.

Permeability samples were taken on undisturbed samples obtained from the cover soils. Samples were collected at a frequency of one test per four acres at the same planar coordinates as the clay barrier layer permeability sample locations (five samples total). Samples were tested in the laboratory in general accordance with ASTM D2434.

Soil classification and particle size distribution samples were taken at the above frequency at the same planar coordinates as the permeability sample locations. Samples were tested in the laboratory by ASTM D2487 and D422, respectively.

2.3.3.2. Procedures

The procedures to collect the cover soil samples were the same as for the clay samples, except that the top 6 inches of topsoil were removed before collecting the cover soil sample. Care was taken to maintain samples in the same manner as for the clay samples, and the samples were taken directly to the laboratory by Wenck and extracted for permeability testing within 24 hours of collection. Geotechnical chain-of-custody forms and reports of the geotechnical analysis are given in Appendix B.

All testing and sampling of the cover soils was performed in accordance with the Work Plan.

2.3.4. Fill Extent

The limits of uncapped refuse as shown on Figure 2-4 were determined using a backhoe owned and operated by Virgil Schaaf Construction Company, Inc. of Eagan, Minnesota. The backhoe was used to dig 10 trench/test pits which were up to 30 feet long and 10 feet deep. The small amount of excavated waste was segregated from natural soil during trenching activities and the materials put back once the limits of uncapped waste were defined. Trenching procedures and findings from the test pit were documented in the field book.

Prior to the backhoe activities, Wenck solicited the help of Mr. Pat Collins, Co-Project Manager of the WDNR and utilized his knowledge of the study area and the locations of previous test pits completed to define limits of uncapped refuse.

2.4. LEACHATE INVESTIGATION

2.4.1. Leachate Level Monitoring

All leachate head levels were monitored using an oil-water interface probe (MMC model #D2401-2U1). Readings using the probe were checked using the wetted tape method and found to be accurate. Both methods used are detailed in the Work Plan. Thickness of the leachate column in each well was also measured to help determine the volume of leachate in the landfill.

The leachate levels and thicknesses are given in Table 2-3 and presented graphically on Figures 2-5 through 2-7. Historical leachate elevations are presented on the hydrographs in Appendix C. Refer to Section 3 of this report which discusses the data.

2.4.2. Leachate Quality

Leachate samples were collected from gas extraction wells with greater than 3 feet of leachate which included GEW-7 thru GEW-10 and leachate head well LHW-1 for laboratory analysis. The results of the analysis were used to help determine if the groundwater at the study area has the same chemical fingerprint as the leachate. The leachate samples were analyzed with the objective to achieve detection limits comparable with those attained for the groundwater samples. For the RI samples analyzed by Method 8260, the laboratory could not achieve these detection limits and had to use a 10-fold dilution. However, prior to Work Plan approval two samples were collected during the pumping test and analyzed by Method 8240. Although not validated, the analysis of these samples did achieve the detection limit objective. Results from past leachate and landfill gas analysis were also reviewed to verify if any correlation exists between chemicals found in the landfill with those found in the groundwater. Table 2-4a provides the specifics regarding the parameter lists and type of analysis that were used on all leachate samples. The parameter lists encompass known groundwater impacts associated with the landfill. Refer to the Work Plan for a detailed discussion on analytical techniques, analytes, and detection limits. Analytical results of the leachate are summarized on Table 2-5 and given in Appendix D. Technical memoranda are presented in Appendix E discussing the quality of chemical data generated. The memoranda conclude that the data objectives were met and that data generated are valid and can be relied to characterize the leachate.

Approximately 24 hours prior to sample collection, the depth to leachate was determined using an MMC probe. Well purging and stabilization were not performed. Leachate samples collected from wells under static condition were considered to be representative of leachate present in the landfill due to the capped nature of the landfill. Leachate samples were collected in dedicated bailers. Leachate sample containers were filled in the same manner as monitoring well sample

containers. However, leachate samples for metals analysis were not filtered. Leachate samples were collected in accordance with the Work Plan.

2.4.3. Leachate Generation Analysis

This analysis consisted of running the computerized Hydrologic Evaluation of Landfill Performance (HELP) model using the soil classification data and vegetative cover information obtained during investigation of the landfill cap and from a local (Stillwater, Minnesota) weather station to determine an infiltration rate through the cap system. The modeling techniques and results are discussed in Appendix F.

2.4.4. Leachate Pumping Tests

A series of four pumping tests were performed in the landfill to determine the hydraulic conductivities, storage coefficients, and if subsurface hydraulic boundaries existed across the landfill. The information supplied by the pumping tests will be used to evaluate the feasibility of leachate extraction.

Pumping tests were conducted at gas extraction wells GEW-7, GEW-8, GEW-9 and LHW-1, using a submersible electric pump. Leachate was pumped to a portable, on-site holding tank with a capacity of 2,000 gallons. By utilizing on-site tanks rather than the existing header system, the potential problem with backflow into the surrounding gas extraction wells was eliminated. A leachate tank truck (owned and operated by ABC Sewer, Inc. of Knapp, Wisconsin) was available for the duration of the pumping tests to haul leachate from the on-site holding tank to the City of Menominee wastewater treatment plant for disposal.

Prior to the start of the pumping tests, the active gas system was shut down to prevent drawing air in from the open GEWs and creating an explosion hazard during the test, and to ensure the only influence on leachate created in the fill was due to pumping. Gas monitoring probes south of the landfill were checked daily when the collection system was down. The system was rebalanced following completion of the tests.

The pumping tests were started at a pumping rate of approximately 1 gallon per minute, but in most cases were adjusted based on drawdown observations. Pumping rates were determined at the on-site holding tank utilizing a 5-gallon bucket and stopwatch. The pumping rate was measured in this manner every ½ hour for the first 4 hours of each test and then every 2 hours for the remainder of the test.

For each pumping test, drawdown was monitored at the pumping location and at the three nearest observation points. Monitoring was performed through the use of an In-situ Hermit 2000 datalogger and four 20 psi In-Situ transducers which measured pressure changes. The pressure transducers were set approximately 0.5 to 1 foot below the leachate level at all of the non-pumping locations. At pumping locations, the transducer was lowered to a depth greater than the pump intake, taking care not to set the transducer on the bottom of the well. All transducers were secured in place (using tape, hose clamps, twine, etc.) with care being taken not to pinch the lead to the pressure transducer. Once in place, each pressure transducer was checked via monitoring the leachate column readings above the transducer on the Hermit datalogger as the transducer was raised and lowered a set distance.

Prior to starting the test, measurements were taken of the leachate column at each transducer and compared with previous readings to ensure the leachate levels were in equilibrium. The pressure changes recorded by the Hermit datalogger were associated with the change in hydraulic head due to drawdown in the well. Leachate head measurements were taken automatically by the datalogger on a logarithmic time scale, with measurements taken at a high frequency during the initial stages of a test and at a lesser frequency as the test neared completion. Once pumping was completed for each test, the datalogger monitored recovery in the pumping well and the three observation wells.

Background conditions were monitored at LHW-2, hydraulically remote to the pumping test areas at roughly a 2-hour frequency during the course of each test. These measurements were made utilizing the oil-water interface probe. The pumping test data was corrected for trends in leachate head not attributable to the influences created by the pumping well. The early time drawdown data at each pumping well was corrected for the effects of casing storage. A

modified Thies Method for unconfined flow was selected to analyze the pumping test data. Appendix G contains a discussion of the modified Thies Method, as well as the raw data. The hydraulic conductivities of the waste mass reduced from the leachate pumping test data are given in Table 2-6.

2.5. LANDFILL GAS INVESTIGATION

The following activities were done to address concerns associated with the off-site migration of landfill gas, specifically in response to the detection of methane in two probes; GW-4A and GW-4B, off-site to the southeast. The work detailed in this section includes the following:

- Data gathering to evaluate the effectiveness of the active gas collection system near the southeastern corner of the landfill.
- Gas migration investigation to evaluate the need for and location of additional permanent monitoring points; and
- Installation of in-home methane monitors and preparation of home evacuation plans to provide interim protection of human health and safety of the nearby residences;

2.5.1. Gas Extraction System Evaluation

To evaluate the effectiveness of the active gas extraction system at the landfill's southeast corner, air emissions from the flare were evaluated and geoprobes were monitored. The field work performed during this task is described below:

2.5.1.1. Air Toxics Assessment

The air toxics emission levels from the existing flare system were assessed by evaluating the quarterly gas samples that have been collected and analyzed by the WDNR as part of ongoing

post closure care. The gas samples were analyzed in accordance with USEPA Method TO-14. An average concentration and maximum concentration of the compounds were determined. The results of the TO-14 analysis and air toxics assessment is provided in Appendix H and discussed in Section 4.

2.5.1.2. Vacuum Tests

Four geoprobes were installed near gas extraction wells GEW-8 and GEW-9 and monitored for pressure (i.e., vacuum) while the active gas collection system was operating (see Figure 2-8). Analyzing the distribution of vacuum readings across the study area provides a means to determine the radius of influence created at these two gas extraction wells and to evaluate the system's effectiveness. Each geoprobe was used to measure vacuum readings (inches of water) at 20 feet below the ground surface.

In addition, vacuum readings were taken twice daily at GEW-1 and at seven gas probes already on-site and three times at GEW-4. This data provided background information on barometric pressures and temperatures (which were collected on an hourly basis) to compare against data collected from the landfill geoprobes.

Pressure readings were collected using a neotronics pocket digital micromanometer. Equipment operation and geoprobe installation were performed in accordance with the Work Plan. Note that the gas flow rate at GEW-8 and GEW-9 was monitored twice daily using the GEM-500 infrared gas monitor, as per the Work Plan. Tables 2-7 and 2-8a present summaries of the vacuum readings.

2.5.2. Gas Migration Investigation

A gas migration investigation was performed to determine the extent of lateral gas migration off-site. The following tasks were completed:

2.5.2.1. Weather Readings

Methane migration from the landfill is controlled by several factors, including changes in ambient air temperature and barometric pressure. The barometric pressure data were obtained from the National Weather Service at the Minneapolis/St. Paul International Airport. These measurements were collected hourly. A temperature probe was placed on-site to monitor ambient air temperature. Readings were taken hourly and the temperature probe was kept in the shade to minimize the effects of direct sun exposure. Weather data collected during the RI are on file at Wenck.

2.5.2.2. Geologic Review

The existing site geology of the landfill site was reviewed to determine if subsurface structures (such as clay and silt layers) may influence the subsurface route of landfill gas or leachate if they were to migrate from the landfill. Geologic cross-sections were developed using existing soil boring data and new geologic data obtained from borings WB-1 through WB-3 drilled during the RI (see Cross Section A-A' on Figure 2-9).

2.5.2.3. Geoprobe Survey

A geoprobe survey was conducted south of the landfill. Geoprobos were advanced along Alexander Road, the railroad right-of-way, and near residences along Highway 12 to quantify the extent of the landfill gas migration. Figure 2-10 shows the geoprobe locations. The geoprobe equipment used was owned and operated by Matrix Technologies, Inc. of Osseo, Minnesota. The geoprobes were advanced by a vehicle-mounted hydraulically-powered soil probing machine that utilizes static force and percussion to advance the 1-inch diameter sampling tool (geoprobe) into the subsurface for collecting soil gas samples. This system features an inner tubing system inserted after the probe rods have been driven to the depth for obtaining a soil gas sample. Utilities were cleared prior to beginning the survey. All geoprobe sampling locations, except GP3RES and GP4RES, were abandoned with a neat cement grout mixture in accordance with WDNR guidelines. GP3RES and GP4RES are still in-place, and remain in use to monitor off-site soil gas. ✓

The geoprobes were completed to a depth of approximately 60 feet at 14 locations. These locations were spaced closer together (approximately 100 feet apart) in the vicinity of GW-2A and GW-2B, where methane concentrations have been previously detected. Sampling interval depths were determined following development of the geologic cross-sections across the landfill, but were at a minimum interval of 20 feet. Methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂) concentrations were recorded at each location and sampling interval utilizing a Landtec GEM-500 infrared gas analyzer. Table 2-8b summarizes the results of the geoprobe gas analysis.

Standard operating procedures for the Landtec GEM-500 and geoprobe installation as presented in the Work Plan were followed.

2.5.2.4. In-Home Methane Monitors

Gas generated within the landfill may spread underground towards adjacent homes if it is not properly controlled. As discussed above, an investigation was undertaken to determine the effectiveness of the gas extraction system (see Figure 2-10). Methane monitors were installed in nearby homes as an interim measure until the final remedy is implemented, at which time it will be determined if the monitors must be maintained for long-term use. The methane monitors are Macurco, Inc. 4SI TM combustible gas detectors with a remote alarm, which have been used in homes near other landfills. Specifications for the monitor are provided in the Work Plan.

Each monitor was set at the factory to alarm at 10 percent of the lower explosive limit (LEL) for methane. At installation, the monitors were tested using a methane standard calibration gas. If actuated, the monitor sounds a loud buzzer (similar to a smoke alarm) and also sends a signal to a remote alarm that may be plugged in within 500 feet. At installation, the monitors were tested using a methane standard calibration gas. The monitors will be inspected on a six-week schedule and sent to the manufacturer on a yearly basis for calibration.

The owners of the four homes that received methane monitors are:

Joseph and Jane Loftus, 888 E. Hwy. 12, Hudson, WI 54016

John Crownhart, 890 E. Hwy. 12, Hudson, WI 54016

Clyde & Marie Stockey, 898 E. Hwy. 12, Hudson, WI 54016

David Wadsworth, 892 E. Hwy 12, Hudson, WI 54016

Besides these homes, the Frederick residence (902 Alexander Road, Roberts, WI 54023) had an ENMET model ISA-44 methane monitor previously installed by the WDNR. The monitor was in their basement prior to the start of the RI. The Fredericks were asked if they wanted a Macurco monitor to be installed in lieu of the ENMET, but they declined. The ENMET will continue to be maintained per the manufacturer's recommendation as part of the landfill post-closure care. The Martineau's (881 East Highway 12, Hudson, WI 54016) were also offered a methane monitor, but they declined. Note that the monitor at the Wadsworth residence was subsequently removed on March 16, 1995, at the owner's request.

In the event that methane alarm sounded in a local residence, Wenck prepared a home evacuation plan as part of the Work Plan. This evacuation plan was presented and discussed with each of the homeowners and local fire department.

2.6. GROUNDWATER INVESTIGATION

The groundwater investigation generally focused on implementing the recommendations presented in Wenck's May 1994 "Technical Review and Evaluation Summary Report." These recommendations were founded on a comprehensive review of pre-existing data and provide a means to fill data gaps, characterize the study area's hydrogeology and groundwater quality. This section presents a discussion of the groundwater investigation activities that were performed to fill the previous data gaps and complete the RI. The specific tasks completed to achieve the objectives listed in Section 1.3 are as follows:

- Geophysical surveys were conducted in the downgradient portion of the plume to investigate sub-surface features in the top of the Prairie du Chien Formation which may influence the magnitude and direction of groundwater flow. The findings were compared with the geologic conditions revealed during the drilling program and with existing residential well logs.
- Three soil borings (WB-1, WB-2 and WB-3) were advanced 10 feet into the Prairie du Chien in the vicinity of the landfill and were used in conjunction with existing boring logs to evaluate geological conditions immediately about the landfill.
- Two upgradient monitoring wells (WW-11 and WW-12) were installed and monitored to evaluate upgradient water quality and provide upgradient hydraulic control points.
- Two sidegradient monitoring wells (WW-13 and WW-14) on the landfill's north and south sides were installed and monitored to evaluate local groundwater flow and water quality sidegradient of the study area.
- A downgradient three-well nest (WW-15A, WW-15B, and WW-15) in the Prairie du Chien was installed to evaluate vertical groundwater quality and vertical head gradients. In addition, the shallow well will serve as a downgradient hydraulic control point for shallow horizontal flow.
- Downgradient monitoring well (WW-16) was installed to provide hydraulic control and water quality information along the southern edge of the plume.

2.6.1. Geophysical Survey

As a precursor to well drilling, Davis-Wright Geophysical, Inc. of Bloomington, Minnesota, was hired to perform a geophysical seismic refractive survey to identify subsurface features at the top of the Prairie du Chien near the downgradient front of the plume. These features are best identified via refractive (as opposed to reflective) seismic waves due to the shallow nature of the bedrock, roughly 60 to 100 feet deep across the study area. Features in the top of the Prairie du Chien, such as channels or bedrock valleys, were investigated because they may alter groundwater flow and act as preferential routes for contaminant transport. Two seismic north-south profile lines (roughly 4,000 feet long) in the vicinity of Bakken Road and LaBarge Road were used. The geophysical survey was conducted in accordance with the protocol established in the Work Plan. A report prepared by Davis-Wright presenting the locations of the seismic lines and documenting the procedures and findings of the survey is given in Appendix I.

2.6.2. Well Log Review

Available logs for residential wells across the study area were used as an aid for interpreting seismic data and in determining the near surface geologic setting for drilling and well placement. These well logs also helped to determine which wells to include in the RI groundwater quality monitoring network. Copies of the well logs are given in Appendix J.

2.6.3. Soil Boring Program

2.6.3.1. Locations and Depths

Three soil borings (WB1 thru WB-3) were advanced on and near the Junker Landfill (see Figure 2-11) as follows:

- WB-1 south of the landfill, approximately 500 feet south of MW-7 (WB-1 was subsequently completed as monitoring well WW-13);

- WB-2 located outside the northern periphery of the fill, between groundwater monitoring wells MW-6 and MW-8; and
- WB-3 located outside the southern periphery of the fill, between groundwater monitoring wells MW-4 and MW-7.

The two southerly borings provided geological data in an area that was of particular concern for two reasons. First, landfill gas evidently migrates off-site in that area. Second, the presence of contaminants in the groundwater in that area appears to be anomalous in that the highest concentrations are found several hundred feet south (sidegradient) of the landfill, rather than in the monitoring wells screened beneath and immediately adjacent to the landfill.

Borings WB-2 and WB-3 helped determine the character, extent, and continuity of the reported layer of fine-grained soils under portions of the fill. In addition, these two borings will enhance the usefulness of existing boring logs from the landfill site by providing the current investigators with first-hand data that was correlated with existing logs developed by previous investigators.

The three soil borings continued into the Prairie du Chien approximately 10 feet in order to investigate the nature of the upper Prairie du Chien surface. The total boring depths were as follows:

| <u>Boring</u> | <u>Depth (feet)</u> |
|---------------|---------------------|
| WB-1 | 125 |
| WB-2 | 125 |
| WB-3 | 113 |

2.6.3.2. Drilling Methods

North Star Drilling, Inc. (a division of Longyear) of Little Falls, Minnesota (a Wisconsin-licensed water well drilling company) was contracted to advance the three soil borings (WB-1, WB-2, and WB-3) and complete monitoring well WW-13 (which used the WB-1 borehole). All investigative drilling activities were supervised by a Wenck hydrogeologist as defined by Chapter NR-712 "Personnel Qualifications for Conducting Environmental Response Actions."

Each of the three boreholes was advanced using the rotasonic drilling method. The rotasonic drilling method uses resonant vibration for the advancement of a core barrel and provides a continuous 6-inch geologic core from each borehole. These cores were contained in plastic sheaths and visually classified in the field in accordance with ASTM Method D2488, "Standard Practice for Description and Identification of Soils." Field screening for organic vapor was performed on 2-foot intervals and upon each change in lithology using the jar headspace technique with a Thermo Environmental organic vapor meter (photoionization detector), which was calibrated at the start of each day to an isobutylene standard. Jar headspace analysis and equipment operation was performed in accordance with the protocol established in the Work Plan.

For each borehole, a WDNR NR-4400-122 "Soil Boring Log Information Form" was completed, signed, and submitted to the WDNR within 60 days upon completion of the drilling program. The completed forms are given in Appendix K.

2.6.3.3. Decontamination

Downhole drilling equipment and associated tools were steam-cleaned prior to use at each drilling location, except WW-14. Due to a mechanical failure, steam cleaning was not able to be performed between drilling at WW-12 and WW-14. Note that WW-12 is an upgradient well, and the risk of cross contamination was minimal.

2.6.3.4. Drill Cuttings Handling Procedures

Disposal of drilling by-products occurred in accordance with the protocol established in the Work Plan. As requested by WDNR personnel, drilling by-products from the soil boring program are currently stored on-site in their plastic sheaths in the metal shed located near the landfill entrance.

2.6.3.5. Borehole Abandonment

Upon completion, boreholes WB-2 and WB-3 were abandoned in accordance with NR-141.25 "Abandonment Requirements" by pumping in a bentonite sand slurry from the bottom up using a tremie line. WDNR NR-3300-5B forms "Well/Drillhole/Borehole Abandonment" were completed for each borehole, signed, and submitted to the WDNR within 60 days upon abandonment of each borehole. Copies of the completed NR-3300-5B forms are in Appendix K. Prior to abandonment, each borehole was monitored for the presence of methane using a triple gas meter operated in accordance with the procedures established in the Work Plan. Methane concentration readings from the top of the boreholes are given below:

| <u>Location</u> | <u>Methane by Volume</u> |
|-----------------|--------------------------|
| WB-1 | < 0.05% |
| WB-2 | < 0.05% |
| WB-3 | < 0.05% |

2.6.4. Monitoring Well Installation

2.6.4.1. Locations and Depths

Eight new groundwater monitoring wells (WW-11, WW-12, WW-13, WW-14, WW-15A, WW-15B, WW-15C, WW-16) were installed across the study area during the January - March 1995 drilling program. Refer to Figure 2-11 for the locations of the new wells.

Two upgradient (WW-11 and WW-12) and two side-gradient (WW-13 and WW-14) water table wells were installed near the landfill. Upgradient well WW-12 was installed about 700 feet east of the Junker Landfill site boundary, and upgradient well WW-11 was installed approximately 1,500 feet south/southwest of WW-12. WW-11 is directly upgradient from the region of highest contaminant concentrations in the groundwater (again, this region is south of the landfill). Sidegradient well, WW-13, was installed approximately 500 feet south of MW-7. This location is between the landfill and the area of highest concentrations south of the landfill. The other sidegradient well, WW-14, is located approximately 1,200 feet north of MW-5, between the landfill and the Girl Scout camp wells, some of which have exhibited contamination. A nest of three wells, WW-15A, -15B and -15C, was installed at the southern end of Bakken Road, about two miles downgradient from the landfill. WW-15A was installed as a water table well, and WW-15B and WW-15C were completed in the middle and towards the bottom of the Prairie du Chien, respectively. The rationale for installation of the well nest was to provide a means to compare water quality and head at various depths in the Prairie du Chien. Monitoring well WW-16 was installed downgradient of the landfill to evaluate water table conditions along the southern boundary of the plume.

The depths of the above eight wells are as follows:

| <u>Well</u> | <u>Depth</u> | <u>Well</u> | <u>Depth</u> |
|-------------|--------------|-------------|--------------|
| WW-11 | 155 feet | WW-15A | 76 feet |
| WW-12 | 175 feet | WW-15B | 151 feet |
| WW-13 | 125 feet | WW-15C | 200 feet |
| WW-14 | 92 feet | WW-16 | 70 feet |

2.6.4.2. Drilling Methods

All observation wells and piezometers, excluding WW-13 which was completed during the soil boring program by North Star, were installed by E.H. Renner & Sons, Inc. of Elk River, Minnesota (a Wisconsin-licensed water well drilling company).

In accordance with Section NR-141.19 "Borehole Diameter," 6-inch diameter boreholes were used for the installation of the wells. Boreholes used for well placement were advanced using mud rotary drilling methods per NR-141.15 "Drilling Methods and Fluids." Potable water was supplied by E.H. Renner & Sons, Inc. or from the City of Hudson Public Works Department to mix drilling and completion slurries. Upon completion of drilling, and in preparation for well placement, boreholes were flushed with clean water to remove drilling slurries. Drilling was performed in accordance with the Work Plan.

2.6.4.3. Well Construction and Materials

Well construction was in accordance with NR-141 "Groundwater Monitoring Well Requirements" and under the direction of a Wenck hydrogeologist. Well construction details are summarized on Table 2-9.

Because the geologic setting (fractured bedrock) was conducive to the loss of drilling fluids, the installation of a 6-inch steel surface casing was necessary in all but three of the monitoring wells (WW-12, WW-15A and WW-16) prior to completion. The decision to install 6-inch surface casing was made when drilling fluid loss occurred in the upper portions of the Prairie du Chien. A 10-inch diameter borehole was advanced to a point below where fluid loss occurred. A 6-inch steel outer casing was then installed in the borehole to the appropriate depth, and the annulus between the casing and the borehole wall was filled with a neat cement grout. The grout was allowed to cure for a minimum of 48 hours prior to the continuation of the borehole.

All wells were constructed of flush threaded, 2-inch diameter, schedule 80 PVC risers as per NR-141.07 "Well Casing," and 0.010-inch continuous slot PVC well screens as per NR-141.09 "Well Screens." PVC is compatible with all reported concentrations of chemicals observed in area wells (Wenck, October 1994). Due to special circumstances at the study area, a fractured bedrock aquifer and fluctuating water table, 20-foot long screens (longer than specified in NR-141) were used to straddle the water table for the shallow wells and to increase the chance of intersecting fractures for the deeper piezometers. Approval from the WDNR as per NR-141.31

"Special Circumstances and Exceptions" for the use of non-standard length screens was obtained before implementing the monitoring well design.

Upon installation of the well, a sand pack (as per NR-141.11 "Filter Packs") was completed to a depth of 2 feet above the top of the screen using No. 30 flint sand followed by a minimum of 2 feet of 50/60 fine Unimin Silica Sand. The sand was installed using a gravity drop method at all wells except the two deep piezometers (WW-15B & C), where a fluid circulation method was used. A 5-foot bentonite seal followed the sand pack. The seal was installed using bentonite pellets and a gravity drop method as per NR-141.13 "Sealing Requirements." The remaining annular space between the riser and borehole wall was filled with a bentonite sand slurry from the bottom up using a tremie line as per NR-141.10 "Tremie Pipes and Sealing Procedures" and NR-141.13 "Sealing Requirements." The boreholes were topped off with slurry as necessary (due to the slurry settling over time).

The top of casing in each of the wells extends approximately 2 feet above grade and is fitted with a vented cap. The well head was secured by grouting a steel, protective outer casing with a locking cap over the top of the riser to a depth of 2 feet using neat cement grout as per NR-141.13 "Sealing Requirements." A well identification tag, as supplied by the WDNR, was completed and attached to the outside of the protective outer cover.

Material-used for sand packs and seals needed to complete the wells are provided on the well construction forms given in Appendix K. Within 60 days upon completion of the drilling program, WDNR NR-4400-113A "Monitoring Well Construction" forms were completed, signed, and submitted to the WDNR for all monitoring wells. The completed WDNR NR-4400-113A forms are in Appendix K.

Well construction was performed in accordance with the Work Plan.

2.6.4.4. Development

After a minimum of 24 hours following completion, each well was developed using air-lifting techniques in accordance with NR-141.21 "Well Development." As stated in the Work Plan, development continued until water clarity, pH, and specific conductivity stabilized. WDNR form 4400-113b (Appendix K) was completed and submitted to the WDNR upon development of each well.

2.6.4.5. Dedicated Sampling Equipment

Each of the newly installed wells was equipped with a WaTerra groundwater sampling system. This system is composed of a dedicated HDPE tube and foot valve extending from the well head to beneath the water table (with the foot valve located approximately 3 feet off the well bottom). The WaTerra dedicated equipment was installed to be compatible with the existing WaTerra equipment in the landfill wells installed prior to the RI. Groundwater samples are drawn through the tube via a portable piston-driven actuator. This device raises and lowers the HDPE tubing, thereby activating the foot valve and lifting a column of water up the tubing. The Work Plan contains technical specifications of the WaTerra sampling system.

2.6.4.6. Decontamination

All downhole drilling equipment and associated tools were steam-cleaned prior to use at each drilling location.

2.6.4.7. Drill Cuttings Handling Procedures

Disposal of drilling by-products occurred in accordance with the protocol established in the Work Plan. Disposal of drilling slurries generated as a by-product of drilling the wells occurred at the well head, per permission given by each landowner.

2.6.4.8. Well Variances

Well construction was in accordance with NR-141 "Groundwater Monitoring Well Requirements." This includes approval by the WDNR of the proposed non-standard length screens (20-foot screens versus lengths of 15 or 5 feet as recommended in NR-141.09 "Well Screen") as per NR-141.31 "Special circumstances and exceptions."

2.6.5. Groundwater Hydraulics

2.6.5.1. Water Table Elevations

After development and stabilization of groundwater levels in the new wells, but prior to each sampling event, a comprehensive depth to groundwater survey was performed on all network monitoring wells. Prior to measuring the depth to groundwater, those wells which did not have a vented cap were allowed to "breathe" until the groundwater level in the well had stabilized. Groundwater elevations are given in Table 2-10.

Depth to groundwater was measured electronically using a decontaminated Solonist brand M-Scope, accurate to 0.01 foot. The weighted end of the tape, with the water level detector, was lowered down the well until contact was made with the water surface, and an alarm sounded. Depth to groundwater measurements were taken relative to a permanent mark located on the north side of the top of the inner casing of each well. Water level measurements were taken in accordance with the protocol established in the Work Plan.

All groundwater level readings for the sampling network were collected on the same day and within as short of a time span as possible to attempt to eliminate any possible interferences with fluctuations in the water table.

Time, well identification, and depth to groundwater were recorded in the field logbook at each well.

2.6.5.2. Hydraulic Conductivity Assessment

In order to assess the capacity of the formation to transmit groundwater contaminants, it was necessary to investigate the hydraulic characteristics of the Prairie du Chien Formation (the near-surface aquifer). Slug tests were conducted on two of the new monitoring wells (WW-12 and WW-15A) to determine local hydraulic characteristics. Standard operating procedures for conducting a slug test as given in the Work Plan were followed. The Bouwer and Rice method for a partially penetrating well in an unconfined aquifer was used to analyze the data. A discussion on the method of analysis and raw data are given in Appendix L. Hydraulic conductivities reduced from the slug test data are given in Table 2-6. A literature search was also performed to compliment the slug tests. Previous hydraulic studies in the area regarding the hydraulics of the Prairie du Chien were reviewed (Norvitch et al 1973).

2.6.6. Spill List Search

Wenck conducted a WDNR spill list search in a 1-mile radius of the study area to identify the potential for sources for groundwater contamination in the area. Two releases were documented on the list at or near the Junker site. The first occurred on November 19, 1989, at the Junker site. It was reported to Wenck that this spill involved the discharge of oil from a drum at the landfill during cap construction activities. The second occurred on May 15, 1991. This spill was located in the northwest quarter of the northeast quarter of section 24, Township 29N, Range 19W, which is approximately at the intersection of Highway 12 and Alexander Rd. According to the list, this spill was caused by a road paving company, though the composition and quantity of the spill were not reported. No other spills were documented that were within close proximity of the Junker Landfill.

2.6.7. Groundwater Quality

To determine the extent and magnitude of contaminants in groundwater across the study area, two rounds (an initial and confirmation) of water samples were taken at all wells in the RI monitoring network as shown on Figure 2-12. In addition to the 30 wells of the RI network (21

monitoring and 9 residential), residential wells at three new homes were sampled, as per protocol established in the Work Plan. The specific locations and compounds analyzed for are given in Tables 2-4a and 2-4b, and the results summarized in Table 2-5. Groundwater sampling protocol for monitoring and residential well sampling as presented in the Work Plan was followed. The samples were submitted to HES, Inc. (HES) located at 525 Science Drive, Madison, Wisconsin. HES is a Wisconsin State Certified laboratory for the analyses used during the RI. HES was responsible for overseeing all laboratory analytical work and laboratory quality control procedures. Appendix D contains the validated analytical reports from HES.

Subsequent to the RI, on June 21, 1995, groundwater samples were collected from wells at 923 LaBarge, 720 Norflex, and the County Garage (666 E Highway 12). These wells were resampled to confirm previous findings.

2.6.8. Chemical Data Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures were implemented to ensure the quality of the groundwater samples. All QA/QC samples collected were documented in the field log book. The data generated by HES was independently validated by M.A. Kuehl Company of 3470 Charlevoix Court, Green Bay, Wisconsin. Refer to the Quality Assurance Project Plan (QAPP) in the Work Plan for specific details on QA/QC procedures used for this project. Technical memoranda are presented in Appendix E discussing the quality of chemical data generated. The memoranda conclude that the data objectives were met and that data generated are valid and can be relied upon to characterize the study area. Note that as discussed in the memoranda, HES reanalyzed many samples for internal consistency. Most of the samples reanalyzed were done after holding times had been exceeded and assigned "R" codes to indicate the data was unusable. This is inconsequential to the data and interpretations presented in this report, as they are based on the results of the original analytical runs, which were performed within the allotted holding times.

2.7. VARIANCES FROM WORK PLAN DURING RI

When feasible the procedures and protocol set forth in the Work Plan were used to complete the investigation. However, due to field conditions, some variances to the Work Plan were necessary. These variances were documented (see Appendix M) and are discussed below. In addition, see Appendix E for a discussion on laboratory analytical procedure variances.

2.7.1. Landfill Investigation

2.7.1.1. Geoprobe Survey

- To properly delineate landfill gas migration, the geoprobe survey had to be expanded to a portion of the residential area along Highway 12 south of the landfill.
- Barometric pressure data was not corrected for elevation since the concern was for a relative change in gas conditions.
- Some of the air samples from the geoprobe locations were taken directly through the 1-inch steel rod probe. This was done because the inner hose connection to the bottom of the rod could not be made at several depths. In each case, at least seven liters of air was evacuated from the rod prior to collecting the sample. The depths and locations where this occurred are noted on Table 2-8.
- Three temporary geoprobe monitoring points were installed rather than the two noted in the Work Plan. This was done in response to the extent of landfill gas migration observed during the investigation.

2.7.1.2. Vacuum Test

All work for the vacuum tests was conducted in accordance with the protocols outlined in the Work Plan with the following exceptions:

- Due to in-waste conditions (sediments clogging the geoprobe rod and high moisture content), pressure measurements below 20 feet bgl were not attempted.
- Four geoprobes were completed in the landfill rather than three as indicated in the Work Plan. Geoprobe GP-4 LF was completed out of the fill approximately 40 feet south-southwest of GP-3 LF to determine if gas could be escaping in the area between GEW-8 and GEW-9.
- Pressure readings were taken in the two gas vents (#1 and #4) at 9:20 A.M. and 2:30 P.M. and not at 9:00 A.M. and 3:00 P.M. as specified in the Work Plan.
- Gas flow rates in GEW-8 and GEW-9 were taken using a Neotronics pocket micromanometer and pitot tube and not the GEM-500 infrared gas monitor as specified in the text in the Work Plan.

2.7.2. Groundwater Investigation

2.7.2.1. Drilling Program

During all of the drilling activities, work was conducted in accordance with the protocols outlined in the Work Plan with the following exceptions:

- The deep piezometers were installed in 6-inch boreholes, rather than 8-inch boreholes. The change was made in response to the fractured nature of bedrock, which made it necessary to install 6-inch steel protective outer casings at drilling locations WW-15B and WW-15C to retain drilling fluids.

- WW-15C was completed at a depth of 200 feet below ground level (bgl) rather than 225 feet bgl as estimated in the Work Plan. The decision was made based on a lithologic change noted during drilling which indicated that the boring was nearing the contact between the Prairie du Chien and the Jordan Sandstone.
- North Star Drilling, Inc. was used in the installation of WW-13 rather than E.H. Renner, Inc. because they were set up at the WW-13 location to advance test boring WB-1.
- Due to a mechanical failure, steam cleaning was not able to be performed between drilling at WW-12 and WW-14.

SECTION 3 - PHYSICAL CHARACTERISTICS

This section of the report focuses on the physical characteristics of the study area and how they relate to the environmental setting of the study area. Discussed below are the RI findings regarding the landfill condition, hydrology, geology, and hydrogeology. The findings and subsequent interpretations presented in this section serve to refine the interpretations presented in previous reports. The information presented in this section should be used to complement subsequent discussions on Extent and Magnitude (Section 4) and Fate and Transport (Section 5).

3.1. LANDFILL CAP

A landfill cap is a cover system installed over the waste to minimize infiltration of precipitation. The following is a summary of the physical characteristics of the Junker Landfill cap:

- The cap was installed in 1990, and is approximately 20 acres in area;
- The cap consists of 2 feet of clay, 2 feet of cover soil plus 0.5 feet of topsoil;
- The cap is well vegetated; and
- Surface water runoff from the cover system is directed to one of two sedimentation ponds adjacent to the landfill on the east side and to the basin on the west side of the landfill.

As reported in Section 2 of this report, the effectiveness of the cap was evaluated as part of the RI through a series of field and laboratory tests. Soil testing data on the cap system are provided in Table 2-2. A summary of the soil testing data is provided in the following narrative.

3.1.1. Clay Barrier

Vertical hydraulic conductivity of the clay barrier layer ranged from $2.6\text{E-}9$ to $6.7\text{E-}9$ centimeters per second (cm/s) for the five clay samples collected in December 1994 (Table 2-2). These values surpass WDNR requirements of less than or equal to $1\text{E-}7$ cm/s for the clay barrier component of the final cover. The clay barrier layer also surpassed WDNR requirements for liquid limit and plasticity index as determined from Atterberg Limits analysis and grain size as determined by hydrometer testing. Based on a modified proctor density of 118.5 pounds per cubic foot for the clay barrier layer from the CWE December 1990 Construction Documentation Report, the percent compaction of the clay barrier layer found during the December 1994 nuclear density testing ranged from 83.4 percent to 92.2 percent. The WDNR requirements for the percent compaction of the clay barrier layer during construction is a minimum 90 percent. The tests that were below 90 percent were influenced by increased moisture conditions. According to the CWE report, the optimum moisture content is 13 percent, or roughly 8 percent lower than the average moisture content observed during the RI. Overall, the soil testing data indicate that the clay barrier is in very good condition and meets WDNR standards five years after construction.

3.1.2. Cover Soils

There is no reported drainage layer directly overlying the clay barrier layer, however, the cover soils generally consist of granular materials.

The vertical hydraulic conductivity of the cover soils ranged from $7.0\text{E-}4$ to $9.2\text{E-}3$ cm/s for the five samples collected during the RI (Table 2-2). Although there are no standards for hydraulic conductivity for this layer, the conductivities are on the low range for proper drainage ($1\text{E-}3$ cm/s) on top of the cap. The cover soils are composed of sands and silts with varying amounts of gravel. The cover soils varied in thickness at the five locations tested from 1.6 to 2.4 feet. Topsoil thickness varied from 0.4 to 1.3 feet. The average frost depth for this region, for non-traffic areas, is roughly four feet. The decomposition of waste in the landfill releases heat which has likely reduced this depth for the landfill cap. The permeability test results of the cap indicate no degradation due to frost has occurred.

3.1.3. Uncapped Waste Limits, Seeps, Settlement Areas, and Surface Water Drainage

The excavation study concluded that additional waste material extended beyond the originally defined capped area over an approximate area of 3700 square feet. As shown on Figure 2-4, the uncapped waste limits extend to the tree line north of the landfill and under the access road in the northwest corner. The composition of waste varied from being generally demolition debris (cement, wood, metal...) in the northwest to municipal solid waste in the north. The depth of the waste in the test pits ranged from approximately one foot in thickness to greater than 10 feet. Assuming an average depth of 10 feet over the uncapped area, there is roughly 1400 cubic yards of uncapped waste.

A walk-through survey of the landfill was conducted on January 6, 1995 to inspect the physical condition of the cap. Settlement areas based on the visual inspection were delineated and are also shown on Figure 2-4. Eleven (11) settlement areas were noted totalling approximately 16,450 square feet or 0.4 acres in area. Future settlement at the landfill will be monitored by surveying the nine existing iron bars installed in the landfill cover (Figure 2-4).

During the May 25, 1995 walk-over, the landfill was observed under warm weather (unfrozen) conditions. Visual observations during this walk-over revealed the presence of an apparent leachate seep adjacent to and at roughly the same elevation as the surface of the northernmost sedimentation basin pond. In addition, erosion gullies and ponding water was observed in the ditchlines collecting surface water run-off and drainage from the cap. Specifically, the southern ditchline had standing water and aquatic vegetation present near the southeastern corner of the landfill, and the northern ditchline had eroded a gully inward from its outfall to the sedimentation basin approximately 100 feet. As part of the Feasibility Study, improvements to the surface water hydraulics will be evaluated.

3.2. LEACHATE

Leachate is the liquid produced as a result of precipitation seeping through a landfill's cap and then percolating through the waste picking up contaminants.

3.2.1. Leachate Generation

A Hydrologic Evaluation of Landfill Performance (HELP) model was generated using site specific parameters obtained during the RI to evaluate the effectiveness of the landfill cap system. In the analysis, input parameters were varied (i.e. slopes and vegetative cover) and infiltration rates determined. Appendix F contains a complete discussion on the HELP model used to evaluate the landfill cap. Assuming an average slope of 7.5 percent across the landfill and good vegetative cover, the HELP model simulated a cap system with an efficiency of approximately 99.5 percent, meaning that only 0.5 percent of the precipitation would seep through the cap. This efficiency would result in the generation of approximately 89,000 gallons of leachate per year across the entire landfill. This relatively small amount of infiltration is indicative of a very good cap.

3.2.2. Leachate Volume

Leachate-levels greater than 2 feet ranging up to about 10 feet have been consistently observed in GEW-7, GEW-8, GEW-9, GEW-10, and LHW-1 in the southeast corner of the landfill. GEW-3, GEW-11, and LHW-2 have also recorded leachate levels, but generally 2 feet or less. No measurable leachate levels have been observed in other GEWs and LHWs in other parts of the landfill. The leachate levels observed during the RI have been generally consistent since cap construction. The observed leachate thicknesses and levels are presented in Table 2-3, and contoured on Figures 2-5, and 2-6, respectively. Based upon the contours, leachate appears to be pooled in the southeast corner of the landfill. The presence of the leachate pool in the southeast corner correlates with the finding of a silt layer at the approximate depth of the landfill base at WB-3 (see Figure 2-9). The relatively impervious silt layer may serve to support the pool by preventing the downward flow of leachate.

The observed leachate thicknesses were contoured to calculate the volume of leachate in the waste mass. Leachate volumes for the observed thicknesses were calculated by multiplying the horizontal extent of leachate by the average thickness and an assumed porosity of 67 percent. The porosity of waste mass used was based upon USEPA literature (600/R-94/168A). It is Wenck's opinion that this porosity value is conservative (i.e. high). Under the observed thickness scenario, the total volume of leachate is 5,000,000 gallons. Note that not all of that volume is free liquid since the field capacity of the waste is quite high, 30 percent, indicating only 3,500,000 gallons is free liquid.

After completing the leachate volume estimate based upon observed thicknesses, a detailed review of the proposed landfill design base grades (Owen Ayres and Associates, 1975) and bottom elevations of the GEWs and LHWs (both of which are fully penetrating) was conducted. There appeared to be a discrepancy between the data. Leachate elevations minus the measured thicknesses were not consistent with the designed base grades. The landfill design base grades indicate more leachate than observed may be present in the areas which did not have observation points.

The design elevation of the landfill base from construction plans appeared to be about elevation 960. However, in some areas, the GEWs indicate a base grade down to an elevation of 952. To determine the potential volume of leachate within the waste, the base-grade elevations of the landfill were estimated from design drawings and from the actual depths of the GEWs, which penetrate the entire thickness of waste mass. To determine potential leachate thicknesses, the leachate elevation contours were superimposed on top of the estimated base grade elevations, resulting in Figure 2-7. This composite drawing indicates potential leachate thicknesses in the southeast corner of up to 24 feet. The scenario shown on Figure 2-7 is a "worst-case" configuration, and is presented for consideration only. It is important to note that there were no leachate thicknesses observed greater than 10 feet. A reason that leachate levels greater than 10 feet were not observed could be that GEW-8 and GEW-9 are on the side slope of the landfill base and not completed on the lower portion of the base.

Under the "worst-case" scenario, using the same porosity and field capacity assumptions, the volume of leachate is estimated to be 10,000,000 gallons, with a free-liquid leachate volume of leachate of 7,000,000 gallons. Of the 7 million gallons, the estimated volume that could be dewatered is about 4,000,000 gallons.

3.2.3. Leachate Hydraulics

Analysis of the data from the pumping tests conducted across the study area yielded hydraulic conductivities ranging from 0.5 to 27 feet per day (ft/day) or 1.76E-4 to 9.52E-3 centimeters per second (cm/s), with a geometric mean of 2 ft/day (7E-4 cm/s). Results from the tests are given in Table 2-6. Three of the four tests yielded hydraulic conductivities on the order of 1 ft/day (3.5 E-4 cm/s). Testing at GEW-9, the most prolific of the gas extraction wells, yielded a hydraulic conductivity of 27 ft/day (9.52E-3 cm/s). The technique (a modified Theis Method) used for interpretation of the data generated during the pumping test is discussed in Appendix G. The leachate in the landfill was found to flow under unconfined conditions.

The surface of the leachate has a gradient of 0.05 foot per foot semi-radially to the north (see Figure 2-6). The mounding of the leachate surface indicates that there is an active recharge source to the waste focused in the extreme southeast corner of the landfill. The amount of leachate flowing horizontally in the waste can be expressed by:

$$Q = kHB \frac{\partial \phi}{\partial r} \quad (3-1)$$

$$\text{Where: } Q = \text{Flow Rate} \left(\frac{l^3}{t} \right)$$

$$k = \text{Hydraulic Conductivity} \left(\frac{l}{t} \right)$$

$$H = \text{Average Saturated Thickness (l)}$$

$$B = \text{Width of Leachate Pool Perpendicular to Flow (l)}$$

$$\frac{\partial \phi}{\partial r} = \text{Hydraulic Gradient (-)}$$

Using the geometric mean hydraulic conductivity and the above gradient, and assuming an average saturated thickness (based on the observed thickness scenario) of 5 feet and a width across the leachate pool perpendicular to flow of approximately 500 feet, it is estimated that approximately 1.3 gallons per minute of leachate flows away from the southeast corner of the landfill; the leachate flow appears to seep through the base in the northwestern half of the landfill. Note that the amount of leachate flow is directly proportional to the saturated thickness, implying that under worst-case conditions (average saturated thickness of 10 feet), the flow is 2.6 gallons per minute.

The rate of leachate generation estimated on the basis of the cap characteristics is equivalent to 0.2 gallons per minute over the entire cap area. This does not account for the volume of leachate flowing in the landfill. However, infiltration could be coming from an adjacent ditch or a localized geologic condition (such as a silt layer) channeling infiltrating rainwater from outside of the cap into the waste mass and maintaining the leachate pool. Borings advanced during the RI in the immediate vicinity of the landfill did encounter perched groundwater in a silty clay layer at an elevation above the leachate levels (see Figure 2-9). Further, during the spring walk-over of the site, ponding and aquatic vegetation were observed in the southern ditchline.

The continuity of the static leachate levels (Figure 2-6) and response during the pumping tests (Appendix G) indicate that the waste is interconnected across the area. However, given the low hydraulic conductivity and the hydraulic effects created by the edges of the landfill, it is estimated that the existing pumping wells could not sustain flow rates greater than 0.5 gallon per minute each.

3.3. LANDFILL GAS

Physical measurements taken on the landfill gas include flow rates from gas extraction wells GEW-8 and GEW-9, and pressures across the southeast corner of the landfill, (see Tables 2-7 and 2-8a). Landfill gas, as with all fluids, flows from high to low pressures. The distribution of landfill gas pressures (vacuums) across the southeast corner of the landfill (see Figure 2-8) indicates that breakthrough from the existing gas extraction system is occurring. In other words, the capture zone created by the GEWs in the southeastern portion of the site is not large enough to contain the landfill gas.

Microbial decomposition (rotting) of the refuse in the landfill releases heat. The temperature of the landfill gas at GEW-8 and GEW-9 was measured during the flow rate assessment. The temperature ranged up to 80° F. The elevated temperature in the landfill increases the potential for VOCs to be concentrated in the landfill gas rather than the leachate.

Contaminant aspects of the landfill gas are discussed in Section 4.

3.4. HYDROLOGY

On average, approximately 32 inches per year of precipitation fall at the study area. Though little of this precipitation seeps through the landfill cap (see Section 3.2.1), in the general area of the landfill about 6 inches seeps into the ground; 6 inches runs off over the ground surface (ultimately to the St. Croix River); and 20 inches is used by plants or is evaporated (Young et al., 1973).

Drainage in the area is generally toward the southwest to the St. Croix River, which ultimately flows into the Mississippi River near Prescott, Wisconsin, 20 miles southwest of the study area. The St. Croix River has a mean flow rate of approximately 4,500 cubic feet per second (cfs), and drains a basin of approximately 7,000 square miles (Young et al., 1973). The St. Croix River has three major tributaries in the area: the Apple (mean flow 300 cfs), Willow (<100 cfs), and Kinnickinnic Rivers (<100 cfs). These tributaries are high-energy streams, with gradients varying from 6 to 40 feet per mile.

There is one small (less than 1 acre) perennial pond in the western portion of the study area near County Road A. The study area also has many small closed basins and associated marshy areas, such as immediately south of the landfill and in the vicinity of the abovementioned pond. There are no major surface water bodies in the study area. However, Shank Lake (with a surface area of roughly 10 acres) is immediately north of the study area. The Willow River and St. Croix River are located northwest and west of the study area and influence groundwater flow in the area as discussed next.

3.5. GEOLOGY

3.5.1. Regional Geology

The study area is situated in the highland area of the St. Croix River Basin. This area is distinguished by flat-topped hills, long ridges, and moderate relief. The near-surface geology of the region consists of glacial outwash and till deposited by the Superior Lobe of the Wisconsin Stage of Pleistocene glaciation. These unconsolidated sediments overlay Ordovician bedrock (see Figure 3-1). In most places the younger members of the Ordovician sequence (Platteville Limestone, Glenwood Shale, and St. Peter Sandstone) have been eroded away, and the Prairie du Chien Group (mostly dolomite) forms the bedrock. The Prairie du Chien Group consists of several members, including the Shakopee Dolomite, a gray to tan, micritic, interclastic, fossiliferous dolomite, overlying the New Richmond Sandstone. Below the New Richmond is the Oneota Dolomite, a brownish dolomite characterized by quartz and calcite-lined vugs. The surface of the Prairie du Chien is highly weathered and on a regional scale is reported to dip slightly to the southwest, though locally the relief in the surface may be effected by erosional features (bedrock valleys). The Prairie du Chien is approximately 150 feet thick across the region. Underlying the Prairie du Chien is the Cambrian-aged Jordan Sandstone, a white to gray, medium to coarse grained quartz sandstone. The Jordan Sandstone is reported to be about 100 feet thick across the area.

Unique to this area is the Mid-Continent Rift System. This failed rift system occurred roughly one billion years ago and is expressed by a thick sequence of flood basalts approximately 40 miles wide extending from Kansas to the Upper Peninsula of Michigan. The axis of the rift in this area is closely approximated by the St. Croix River Valley. Associated with the rift system is the Twin Cities basin containing paleozoic aged sedimentary rocks, including the Prairie du Chien group and the Jordan Sandstone. During deposition of the sediments, the basin began a rapid subsidence which caused areas along the flank of the basin to rise. This caused normal faulting in the sedimentary rocks within the basin. The faults have been reported to have offsets of more than 200 feet, such as occurs just east of Hudson and west of the study area.

The above discussion of the regional geology is based on Borman (1976), Hogberg (1972) Ojakangas & Matsch (1982), and Young (1973).

3.5.2. Local Geology

Locally, the geologic units encountered during the RI were consistent with published information on the regional geology in the area. The geologic findings from the drilling program and seismic survey are presented graphically on cross sections A-A' (north-south) through the landfill, B-B' (east-west) from the landfill to County Road A, and C-C' (north-south) along County Road A, and are included as Figures 2-9, 3-2, and 3-3, respectively.

The top of the Prairie du Chien was found to vary from roughly 910 feet NGVD at the drilling locations near the landfill, to 860 feet NGVD about 2 miles west of the landfill in the vicinity of Bakken Road (WW-15 nest), to less than 830 feet NGVD near County Road A. No large, continuous erosional features were found in the surface of the Prairie du Chien during the RI drilling program or the refractive seismic survey (Appendix I presents a comprehensive discussion on the seismic survey). Though this finding is based on limited data, the absence of major bedrock valleys is supported indirectly by the uniform groundwater flow pattern established using groundwater elevations at over 20 wells as control points. The potential existence of a bedrock valley was targeted during the investigation due to the change in the groundwater flow pattern that such a feature could create. While there may be minor bedrock valleys in the top of the Prairie du Chien, what is germane to the project is that the hydraulic effect created by such features is not large enough to significantly alter groundwater flow.

The topography and local well logs (see the log for 963 LaBarge in Appendix J) suggest that sinkholes may be present. Sinkholes are discrete, vertical, dissolution features common in carbonate formations such as those present in the Prairie du Chien Group.

Near the landfill, unconsolidated glacial sediments overlying remnant St. Peter Sandstone were found above the Prairie du Chien Group in each of the soil borings (WB-1, WB-2, and WB-3) and two of the monitoring wells (WW-12 and WW-13). The thickness of the St. Peter

Sandstone at these locations ranged from approximately 5 feet at WB-2 to 40 feet at WB-1. Further west of the study area, at WW-16 and the WW-15 nest, the St. Peter Sandstone was absent. The thickness of the glacial sediments ranged from 58 feet at the WW-15 well cluster to 125 feet at WW-11.

Geologic logs from borings WB-1 through WB-3 revealed that the unconsolidated material near the landfill was composed predominately of sand and gravel, though silt layers were also encountered. These layers were thin (less than 5 feet) and appear to be discrete, as they occur at varying elevations (990 at WB-3, 960 at WB-2, and 945 at WB-1) and may be fluvial in origin (thus essentially horizontal). This is consistent with the findings reported from previously installed borings B-16 through B-19 (CWE, 1989). These borings reported relatively thin silt layers (less than 5 feet) at elevations around 960 overlying a thick, sculpted, silt stone (possibly the lower St. Peter Sandstone as found in the WB borings). These borings were advanced along an east-west line centered approximately 100 feet north of the flare house. The borings are not shown on a map as accurate survey information is not available. The influence which these silt layers and variable geology have on contaminant migration is discussed in Section 5.

3.6. REMEDIAL INVESTIGATION GROUNDWATER MONITORING NETWORK

As part of the RI, a network of strategically located wells (9 residential and 21 monitoring wells) was monitored for groundwater quality or elevation or both. These wells are shown on Figure 2-12 in plan view and Figure 3-4 shows the vertical screened positions of the wells in the monitoring network relative to one another. Most of the monitoring wells are water table wells; the exceptions are MW-3, MW-10, MW-50D, WW-11, and WW-15B and WW-15C which are screened below the water table and completed as a well nest. Most of the residential wells are screened beneath the water table.

In accordance with the RI, groundwater elevation was also measured at new residential wells (post-August 1994) constructed in the area. These wells were at 962 LaBarge Road, 786 Tanney Lane, and the Tjadin property just southeast of the Highway 12 and Yellowstone Trail intersection. Depth to groundwater was measured in these wells in January 1995. In March the wells were in use and

unavailable for depth-to-groundwater measurements. Nevertheless, the January water levels from these wells were used as an aid while generating the March 1995 groundwater elevation contour map (Figure 3-5) because the wells are screened in the Prairie du Chien and provide hydraulic control downgradient and sidegradient of the landfill. Though not directly comparable to the elevations measured in March, the January data for these wells were used in a qualitative sense, assuming that the water table as a whole fluctuated an equal amount during the time elapsed between the measurements (refer to groundwater elevations in Table 2-10). The water table fluctuations in that interval were small compared with the spatial variation in the water table evidenced by those wells.

3.7. GROUNDWATER FLOW

3.7.1. Regional Groundwater Flow

Regionally, shallow groundwater occurs in the Prairie du Chien Group or, closer to the St. Croix River, in unconsolidated glacial material. Groundwater flow is generally to the west toward the St. Croix River, the major groundwater discharge area for the region. On a broad scale the saturated portion of the Prairie du Chien Group and the deeper Jordan Sandstone act as one hydraulic unit, and are often referred to collectively as the Prairie du Chien-Jordan Aquifer. This system is bounded beneath by the St. Lawrence Formation, a competent dolomite which acts as a hydraulic barrier to vertical flow. Local variations in flow direction are caused by interaction with surface water features (such as the Willow River) or deflections of groundwater created by changes in the geology (such as clay pods, or fractures).

Although the two formations are often considered as one when determining regional hydraulic characteristics, the Prairie du Chien, being the near-surface aquifer, is particularly germane to the environmental setting of the study area. Previous investigations have addressed the Prairie du Chien individually, and based on pumping test data collected from wells completed in the Prairie du Chien, an average hydraulic conductivity of 34 ft/day ($1.2\text{E-}2$ cm/s) was calculated (Norvitch, et al., 1973).

This average is based on three pumping tests conducted in the Twin Cities basin (Bloomington, Osseo, Minnetonka, MN).

3.7.2. Local Groundwater Flow

Locally, groundwater flows under unconfined (water table) conditions in the upper portions of the Prairie du Chien in the vicinity of the landfill, and in the overlying unconsolidated glacial sediments in areas further to the west, such as at WW-16 and MW-13. The Prairie du Chien was found to be almost entirely saturated across the study area with an average thickness of 200 feet, slightly thicker than the regional average.

3.7.2.1. Hydraulic Conductivity

To obtain local control of horizontal hydraulic conductivity across the study area, slug tests were conducted on two of the new shallow monitoring wells (WW-12 and WW-15A). The results indicate an average hydraulic conductivity of 21 ft/day ($7.4\text{E-}3$ cm/s) (Table 2-6), very near the values reported for regional conditions in the Prairie du Chien ($1.1\text{E-}2$ to $1.3\text{E-}2$ cm/s; Norvitch et al., 1973). The method of analysis for the slug test data is given in Appendix L.

3.7.2.2 Horizontal Flow

A comprehensive depth-to-groundwater survey was performed on all of the RI monitoring wells across the study area. The measurements and corresponding groundwater elevations (head) are given in Table 2-10. The maximum depth to groundwater (175 feet) was at the Tjadin property, south of the landfill, and the minimum (20 feet) was at MW-11, in the eastern half of the study area. Depth to groundwater across the study area varied in response to changes in topography and groundwater elevation. Water table elevations are contoured on Figures 3-5 and 3-6. The water table across the study area had a total relief of over 60 feet. The maximum head was at WW-12 (908.22 feet NGVD) just east of the landfill, and the minimum head was at MW-50D (847.70 feet NGVD) just west of County Road A.

As shown on Figure 3-5 the groundwater flow is in a west-northwest direction, generally consistent with the regional flow pattern. The slight variation from the regional flow direction is due to the dominant hydraulic influence across the study area of discharge into the Willow River,

located about 3 miles west-northwest of the study area (see Figure 1-1). The gradient of the water table varies slightly across the study area from 0.003 (foot per foot) just north of west in the southwestern portion of the study area to 0.005 to the northwest across the northeast part of the study area, and averages 0.004 to the northwest. Immediately about the landfill, the water table appears to flatten beneath the capped area (Figure 3-6), apparently in response to the infiltration deficit created by the cap. Just west of the capped area, the water table is mounded, possibly due to focused recharge from cap run-off or in response to preferential infiltration due to geologic conditions in the unsaturated zone. The local gradient in the vicinity of the landfill averages 0.003 to the west-northwest.

The horizontal groundwater velocity across the study area can be expressed with Equation 3-2:

$$V_h = \frac{k_h}{n} \frac{\partial \phi}{\partial x} \quad (3-2)$$

Where: V_h = Horizontal Groundwater Velocity $\left(\frac{l}{t}\right)$

k_h = Horizontal Hydraulic Conductivity $\left(\frac{l}{t}\right)$

n = Effective Porosity (-)

$\frac{\partial \phi}{\partial x}$ = Hydraulic Gradient (-)

Using the reported regional hydraulic conductivity of 34 feet per day, an effect porosity of the Prairie du Chien of 0.06 (Delin, 1994) and the average gradient of 0.004 to the northwest, the mean groundwater velocity is approximately 850 feet per year. Horizontal groundwater flow in the Prairie du Chien across the study area is fairly uniform, and as such, the amount of groundwater flowing in the study area (SWCA from County Road A east) can be expressed with Equation 3-1. Assuming a width of the SWCA perpendicular to groundwater flow of about 1 mile, approximately 750 gpm is flowing across the study area.

3.7.2.3. Vertical Flow

During the RI monitoring in winter 1995, the potential for vertical flow in the Prairie du Chien was downward beneath the landfill (MW-9 and MW-10 nest), and upward closer to the Willow River at Bakken Road (WW-15A through WW-15C nest). Monitoring well nest MW-9 (shallow) and MW-10 (deep) had an average downward vertical gradient of 0.03 (foot per foot), indicating groundwater recharge in the vicinity of the landfill. This may be a transient condition however, as review of historical water elevation data reveals that an upward vertical gradient has been present at this well nest in the past (Table 2-10). At the WW-15 well nest located west of the landfill on Bakken Road, closer to the Willow River, the vertical gradient in the Prairie du Chien averaged 0.0003 upward. Upward gradients are characteristic of groundwater discharge areas such as the Willow River. To date, there are not enough measurements to tell if the upward gradient is a seasonal condition or if it is constant year-round. There is another well nest near County Road A consisting of WDNR wells, MW-50S and MW-50D. However, comparison of heads between these two adjacent wells is not indicative of vertical flow in the Prairie du Chien. The head in MW-50S is approximately 20 feet greater than that in MW-50D, which is only physically possible for these two wells if MW-50S is screened in a perched zone. Thus MW-50S is not representative of flow in the Prairie du Chien. Accordingly, MW-50D and not MW-50S was used as a hydraulic control point for horizontal flow.

Groundwater levels in the Jordan are not available to quantify the flux and direction of groundwater flow between the Prairie du Chien and Jordan. On a broad scale the Prairie du Chien and Jordan comprise one hydraulic unit and the head differences between them are slight. The fact that none of the seven Jordan wells across the study area have been contaminated indicates that vertical flow is on average upwards, or the magnitude of groundwater flowing downwards is slight.

3.8. GROUNDWATER USE

The Prairie du Chien-Jordan Aquifer is the main water source for most municipalities and industries across the region. Cities nearby which draw water from the Prairie du Chien-Jordan Aquifer include: Roberts at 0.04 million gallons per day (mgd), Baldwin at 0.16 mgd, and River Falls at 1.2 mgd (Young, et al., 1973). Individual well yields have been reported as high as 2,800 gpm. The City of Hudson, however, draws approximately 5 mgd from five wells completed in the deeper Mt. Simon Sandstone. This formation is separated from the Prairie du Chien-Jordan Aquifer by multiple confining layers and a large vertical separation (the top of the Mt. Simon occurs at an elevation roughly 300 feet lower than the base of the Jordan). In the study area the predominant use of groundwater is for domestic and agricultural purposes, and the wells are of relatively low yield. A total of 68 private wells are in use across the study area. Well construction logs were available for 57 of the wells (given in Appendix J), and the locations from which they draw water are summarized in Table 3-1. Of the 57 wells with logs, seven draw water from the Jordan Sandstone, three withdraw from unconsolidated glacial material, and the remaining 47 pump water from the Prairie du Chien.

SECTION 4 - NATURE AND EXTENT OF CONTAMINATION

During the course of the RI, the landfill gas, landfill leachate and groundwater were tested for chemical composition. This section discusses the types, concentrations, and extent of contaminants in the various media (gas, leachate and groundwater) across the study area.

4.1. LANDFILL GAS

4.1.1. Nature of Landfill Gas

The landfill gas at the Junker Landfill is comprised of approximately 50 percent methane, 40 percent carbon dioxide, less than 1 percent oxygen, and 9 percent other gases, including nitrogen and volatile organic compounds (VOCs). This composition implies an average molecular weight of approximately 29 grams per mole, similar to that of atmospheric air. Thus the density of the landfill gas is also about the same as that of air. Consequently, migration of the landfill gas is not expected to be dominated by density-driven flow. Table 2-8b presents the results of the methane gas probe investigation.

The WDNR collected landfill gas samples on four occasions in 1994 as part of the landfill operations and maintenance program. These samples were collected from the blower (before the flare) and were analyzed for concentrations of 39 organic compounds using USEPA Method TO 14. The TO 14 compounds fall in the class of volatile organic compounds (VOCs). The laboratory results are given in Appendix H and are discussed below.

The composition of TO 14 organics in the landfill gas was highly consistent. Petroleum-based compounds and chlorinated solvents predominated. Average concentrations of petroleum-based compounds were toluene 34,000 parts per billion volumetric (ppbv), o-xylene 7,300 ppbv, m- and p-xylene 25,000 ppbv, ethylbenzene 10,000 ppbv, total trimethylbenzene 2,600 ppbv, benzene 800 ppbv and styrene 400 ppbv. Chlorinated solvent average concentrations were vinyl chloride 3,500 ppbv, methylene chloride 2,100 ppbv, tetrachloroethene (PCE) 1,600 ppbv, dichloroethene 1,200 ppbv, trichloroethene (TCE) 800 ppbv, dichlorodifluoromethane (freon-12) 600 ppbv, and trichlorofluoromethane (freon-11) 500 ppbv. A few compounds were detected other than those

listed, but at low levels near detection limits. Some compounds such as vinyl chloride and dichloroethene may not have been originally disposed of in the landfill, but could be present in the landfill gas as degradation products of compounds which were.

In 1994 approximately 4,000 pounds of VOCs (as detected in the TO-14 analysis) were captured by the gas extraction wells and sent to the flare. Of the total, petroleum-based compounds accounted for over 85 percent, and chlorinated solvents 10 percent. The chlorinated solvents include the compounds of primary concern in the groundwater: TCE, PCE, freon-11, and freon-12. Listed below are the mass extraction rates of the predominant VOCs in the landfill gas:

| Compound | Pounds Extracted in 1994 | % of Total |
|------------------------|--------------------------|------------|
| Total Xylene | 1,888 | 47% |
| Toluene | 1,373 | 34% |
| PCE | 113 | 3% |
| 1,2,4-Trimethylbenzene | 88 | 2% |
| Vinyl Chloride | 88 | 2% |
| Methylene Chloride | 79 | 2% |
| cis-1,2-Dichloroethene | 47 | 1% |
| TCE | 44 | 1% |
| 1,3,5-Trimethylbenzene | 35 | 1% |
| Freon-12 | 30 | 1% |
| Freon-11 | 29 | 1% |
| Benzene | 25 | 1% |
| Styrene | 14 | 0.4% |
| 1,1-Dichloroethane | 11 | 0.3% |
| Hexachlorobutadiene | 11 | 0.3% |
| Totals for the above | 3,875 | 97% |

The air emission levels from the existing flare were assessed using the 1994 quarterly gas data and a conservative flare destruction efficiency of 95 percent. The resultant maximum air emission rates were then compared to the WDNR Hazardous Air Pollutants Emission Standards (NR 445). The actual emission rates for the compounds were well below the maximum allowable emission rates (see Appendix H).

4.1.2. Extent of Landfill Gas

The geoprobe soil gas survey completed during the RI revealed a narrow "finger" of landfill gas (as characterized by methane) which has migrated between gas extraction wells GEW-8 and GEW-9 off-site to the south approximately 1,000 feet as shown on Figure 2-10. This area where gas migration has occurred is near the location of the highest concentrations of VOCs in the groundwater. This finding is evidence that the pressure build-up of gases in the landfill caused by decomposition of the refuse material is forcing some landfill gas to migrate outward from the landfill. Significantly, the build-up of leachate in the southeast corner of the landfill has optimized moisture conditions for increased gas production in this area. The geoprobe findings are supported indirectly via the results of headspace monitoring during advancement of borings WB-1, WB-2 and WB-3 (see Appendix K). Of these borings, only WB-3 had detections of landfill gas in the headspace. Both photoionization (which detects VOCs) and flameionization (which detects both VOCs and methane) detectors were used to analyze headspace in samples from this boring. The differences in the instrument readings provide a qualitative means to determine the relative concentrations of VOCs and methane in the gas. Relevant to the discussion present in Section V on fate and transport, landfill gas migrating from the southeast corner of the landfill at WB-3 contains a *ratio* of up to 40 percent VOCs to methane. Prior to the implementation of a remedy to halt gas migration, soil gas off-site will be collected and analyzed for VOCs to serve as a baseline with which to gauge remedial performance. *

The lower explosive limit (LEL) for methane is 5 percent by volume. The approximate extent of landfill gas [characterized by methane concentrations at or above 25 percent of the LEL, or 1.25 percent by volume, in accordance with WDNR Code NR 504 section 504.05 (7)(a)] is shown on Figure 2-10. The extent of landfill gas outlined during the geoprobe investigation was observed during relatively stable, high pressure atmospheric conditions (29.98 to 30.36 inches of mercury). The pressure gradient between the landfill and atmosphere which drives the gas migration is not a constant. The extent of landfill gas would be expected to be greater if observed during low pressure atmospheric conditions. Under a low pressure weather cell, the pressure difference between the interior of the landfill and the atmosphere is increased relative to high pressure

atmospheric conditions. This increase in the pressure gradient provides the additional energy to drive landfill gas to a greater extent. As such, the extent of landfill gas migration shown on Figure 2-10 does not represent the historical limit, but rather a "snap-shot" of time during the RI.

The highest methane concentration found during the RI survey was 68.3 percent by volume at geoprobe "GP4 Alex" along Alexander Road, at 52 feet below ground surface (refer to Figure 2-9). Methane was detected near only one residence, 890 E. Hwy 12, which is approximately 1,000 feet south of the landfill. The geoprobe at this location, GP3RES, had a maximum concentration of 5 percent methane by volume at 55 feet below ground surface (980 feet NGVD). To date, no in-home methane monitor alarms have sounded.

Figure 2-9, which shows the vertical extent of methane, indicates that the geology underlying the study area is not homogeneous, and that a preferential pathway for landfill gas migration exists. Vertically, the migration of landfill gas is hindered by the presence of relatively impervious materials such as the silty clay continuous across the surface and deeper silt layers like the one encountered at 960 feet NGVD in WB-3 next to the landfill. The horizontal migration of landfill gas occurs in permeable sand and gravel deposits.

4.2. LEACHATE

4.2.1. Nature of Leachate

Leachate samples were collected during the RI from five wells (GEW-7, GEW-8, GEW-9, GEW-10, and LHW-1) and analyzed for VOCs, semi-volatile organic compounds (SVOCs), polychlorinated bi-phenyls (PCBs), pesticides, and metals. Analytical results from the samples are given in Appendix D and summarized in Tables 2-5 and 4-1.

Two leachate samples were also collected during the leachate pumping test, conducted prior to final Work Plan approval. The VOC analytical method used for these samples (Method 8240), differed from that in the approved Work Plan (Method 8260), and the samples did not undergo the vigorous validation procedure that was applied to the RI data. However, these earlier results are included in Appendix D and Tables 2-5 and 4-1 because the samples were collected by

appropriate protocol and analyzed by standard USEPA methodology. These samples are important for the fact that with this method lower VOC detection limits were achieved.

Relative to Wenck's experience with leachate at other sites, the leachate at the Junker Landfill is characterized by generally low levels of compounds from each of the various analyte groups. To illustrate the generally low contaminant concentration in the leachate, the leachate concentrations were compared to health-based *groundwater* enforcement standards (ES). Of the comprehensive list of analytes only tetrahydrofuran (THF) exceeded its ES in all five leachate samples; total xylene and arsenic exceeded their respective ES in one sample each. Secondary standards, which are based on aesthetics (odor, taste... etc.), were exceeded for iron and manganese in all five samples.

Based on the RI data, 24 of the 58 VOC analytes were detected in the leachate. The maximum VOC concentrations in the landfill leachate were for THF (44,000 micrograms per liter [$\mu\text{g/l}$]), and xylene (1,000 $\mu\text{g/l}$), both at GEW-9. Conspicuously absent were TCE, PCE, freon-11, and freon-12, the compounds of main concern in the groundwater. Based on the pumping test sample results and all other available data (see Appendix N), TCE was detected only twice (1 $\mu\text{g/l}$ ["J"-i.e., estimated] at GEW-7 and 0.9 $\mu\text{g/l}$ [J] at GEW-9 in December 1994), PCE was detected also only twice (1 $\mu\text{g/l}$ [J] at GEW-7 and 2 $\mu\text{g/l}$ at GEW-9 in December 1994), freon-11 has never been detected in the leachate, and freon-12 was detected only once (6.6 $\mu\text{g/l}$ at LHW-1 in March 1992). Table 4-2 compares the historical maximum concentrations of VOCs in the leachate and groundwater.

The low detections of TCE imply that the entire leachate volume would contain less than 0.1, pounds or 2 tablespoons, of TCE, even assuming maximum leachate thicknesses.

As presented in Section 3, up to 2.6 gallons per minute may be seeping through the landfill base. Given that the concentration of TCE in the leachate is approximately 1 $\mu\text{g/l}$, the total mass of TCE leaving the landfill via the leachate is less than 0.01 lb/yr (0.2 tablespoons per year).

Because the leachate is at an elevated temperature (roughly 80° F) and there is an active gas collection system at the landfill, VOCs may have been "stripped" from the leachate into the landfill gas. This concept is supported by the presence of high concentrations of VOCs in the landfill gas (as discussed in the previous section), and the fact that the only organics at high concentrations in the leachate are THF and xylenes, which have lower volatility than most other VOCs.

Six of the 64 SVOC analyzed for were detected. Phthalate compounds (plasticizers) occurred in six of the seven samples, methyl phenol compounds (petroleum-based compound) occurred in three, 1,4 Dichlorobenzene commonly used as an insecticide was detected in one sample, and naphthalene (a petroleum-based compound) was found in three. BETA-BHC and DELTA-BHC were the only compounds of the 28-member PCB/pesticide group that were detected. BETA-BHC occurred in five of the seven samples at concentrations of less than 0.2 µg/l. DELTA-BHC occurred in one sample at a concentration of 0.2 µg/l.

Appendix O presents a cumulative summary of inorganic data for the leachate. Fourteen of the 23 metals analyzed for were detected in the leachate. To put in perspective, of the metals detected, only arsenic in one sample exceeded the *groundwater* ES. Iron and manganese exceeded secondary ES in each of the five samples. Nine other metals besides arsenic, iron and manganese were detected in the leachate, however, at low levels. The other metals detected were: aluminum, barium, cobalt, copper, chromium, nickel, lead, vanadium, and zinc. The metal analytes not detected include beryllium, cadmium, mercury, silver, selenium, antimony and thallium.

Cationic fingerprints of leachate samples were constructed based on the major cations, calcium, magnesium, sodium and potassium. For each cation, the concentrations in µg/l were converted to milliequivalents per liter (meq/l) to account for the different molecular weights and electrical charges of the cations. The concentrations (in meq/l) of each cation can then be directly compared (Appendix P).

The cationic fingerprint of the leachate is distinguished by the presence of sodium at milliequivalent concentration greater than 50 percent of the total cations. Also present at high levels in the leachate is potassium. This is a typical cationic fingerprint for leachate. By contrast, unimpacted groundwater in this region would be expected to have high proportions of calcium and magnesium and low proportions of sodium and potassium. These cations are "conservative" (meaning they do not change forms in the environment) and can be used to mark areas where leachate may have impacted the groundwater, as discussed subsequently.

4.2.2. Extent of Leachate

Leachate elevations and thicknesses as measured in the gas extraction wells and leachate headwells are given in Table 2-3, and presented graphically on Figures 2-5 through 2-7. As shown on the figures, leachate buildup is confined to the southeast corner of the landfill. Though leachate does not appear to be directly impacting groundwater quality, its presence can in some instances promote the generation of landfill gas. The migration or transport of leachate out of the landfill is described in Section 5.

4.3. GROUNDWATER

4.3.1. Nature of Contaminants

A total of 35 (21 monitoring and 14 residential/private) wells were sampled as part of the RI during two rounds of sampling in January-February and March 1995. Among the sampled wells were three new residential wells and two previously existing private wells (St. Croix County Garage and industry at 720 Norflex Drive). The samples were variously analyzed for VOCs, SVOCs, PCB/pesticides and metals (see Tables 2-4a and 2-4b).

A comprehensive sampling for VOCs in private wells was undertaken in August/September 1994 by the Junker Landfill Group. The data and findings were presented in the report entitled "Residential Well Sampling Report," (Wenck, October 1994). Data from that sampling were used in conjunction with the data generated during the RI to determine the extent and magnitude of groundwater impacts.

4.3.1.1. VOCs

Eighteen of the 51 VOC analytes analyzed for were detected in groundwater samples collected during the RI, mainly at low levels and many from wells in close proximity to the landfill. The VOCs most common in the groundwater were TCE (detected in 21 of the 35 wells), PCE (detected in 5 wells), freon-11 (detected in 15 wells), and freon-12 (detected in 16 wells). Table 2-5 presents a cumulative summary of these compounds, including the results from the two VOC sampling rounds conducted during the RI.

Based on the most recent data (August/September 1994 and the RI sampling events), the only VOCs detected in groundwater above ES were benzene and TCE. Historically, benzene is not commonly detected in the groundwater (see Appendix N). The most recent detections in two wells represent the only exceedances of ES to have occurred to date (see Table 4-2). The ES for benzene in groundwater is 5 µg/l. Benzene was detected in the first sample taken from WW-15B at 7 µg/l in February 1995. As is common practice with newly installed wells, a confirmation sampling round (RI round 2) was performed in March 1995. Benzene was not detected in the confirmation sample at a detection limit of 0.5 µg/l, implying that the initial presence of benzene in the well may have been an artifact of the well installation process or sampling. Benzene was detected at 5 µg/l at 923 LaBarge in March 1995. This is the only detection of benzene ever reported at this well (which has been monitored since 1984), including the RI round 1 sample in February 1995. For this reason a confirmation sample was collected from this well on June 21, 1995. Benzene was not detected in the confirmation sample at a detection limit of 0.2 µg/l. The historical data and results from the confirmation sample imply that the benzene detection in March 1995 was anomalous, and did not represent in-situ groundwater quality at this location.

The wells in which TCE exceeded its ES of 5 µg/l since August 1994 are as follows:

Monitoring Wells: MW-3
MW-5
MW-7
WW-13

| | | |
|--------------------|-----------------|--------------------|
| Residential Wells: | 942 Alexander | 881 E Hwy. 12 |
| | 888 E Hwy. 12 | 890 E Hwy. 12 |
| | 898 E Hwy. 12 | 756 Holden Lane |
| | 792 Holden Lane | 783 Holden Lane |
| | 932 LaBarge | 953 LaBarge |
| | 959 LaBarge | 763 McCutcheon Rd. |
| | 981 Tanney Lane | 795 McCutcheon |
| | 982 Tanney Lane | |

See Figure 4-1a for the TCE concentrations (shown in red) corresponding to the above locations.

The preventative action limit (PAL) is a concentration threshold for a substance set at a level from 50 percent to 10 percent of the ES. When the PAL is attained or exceeded, it triggers the WDNR to evaluate the situation.

In addition to the wells which exceeded enforcement standards, the following wells have exceeded the PAL for TCE of 0.5 µg/l:

Residential Wells:

| | |
|---------------------|-----------------------------|
| 980 County Road A | 962 Bakken Road |
| 928 County Road A | 961 Bakken Road |
| 696 McCutcheon Road | 957 Bakken Road |
| 704 McCutcheon Road | 954 Bakken Road |
| 712 McCutcheon Road | 947 Bakken Road |
| 757 McCutcheon Road | 963 LaBarge Road |
| 775 McCutcheon Road | 929 LaBarge Road |
| 783 McCutcheon Road | Girl Scout Camp Troop House |
| 786 McCutcheon Road | 720 Norflex Drive |
| 794 McCutcheon Road | 881 Kingsway |
| 832 McCutcheon Road | |

Monitoring Wells:

| | |
|----------------|--------|
| Nor-Lake MW-13 | WW-15C |
| MW-4 | MW-10 |
| WW-11 | MW-9 |
| WW-15A | MW-8 |
| WW-15B | WW-14 |

Finally, the following wells had TCE reported as present at undetermined concentrations below a quantitation limit of 0.6 µg/l and therefore may have exceeded the PAL for TCE:

| | |
|---------------------|-------------------|
| 671 McCutcheon Road | 970 Bakken Road |
| 677 McCutcheon Road | 917 LaBarge Road |
| 695 McCutcheon Road | 767 Holden Lane |
| 710 McCutcheon Road | 880 Badlands Road |

These 29 residential and 10 monitoring wells listed above are shown in yellow Figure 4-1a. The following wells had PAL exceedances (greater than or equal to 0.5 µg/l) for PCE:

Residential Wells:

| | |
|------------------|---------------------|
| 947 Bakken Road | 775 McCutcheon Road |
| 957 Bakken Road | 795 McCutcheon Road |
| 963 LaBarge Road | 832 McCutcheon Road |
| 932 LaBarge Road | Troop House |
| 953 LaBarge Road | 942 Alexander |
| 959 LaBarge Road | 756 Holden |

These 12 wells have concentrations shown in yellow on Figure 4-2a.

Though currently not above ES, historically the following wells have had VOC ES exceedances:

Monitoring Wells:

| <u>Well</u> | <u>Compound</u> |
|-------------|--------------------------|
| MW-3 | TCE |
| MW-4 | PCE, TCE, Vinyl Chloride |
| MW-5 | TCE, Vinyl Chloride |
| MW-6 | PCE, TCE, Vinyl Chloride |
| MW-7 | TCE, Vinyl Chloride |
| MW-8 | Vinyl Chloride |
| MW-9 | TCE, PCE |

Residential Wells:

| <u>Well</u> | <u>Compound</u> |
|---------------------|--------------------------|
| Troop House | PCE, TCE, Vinyl Chloride |
| 792 E. Highway 12 | TCE |
| 794 McCutcheon Road | TCE |
| 881 Kingsway Road | TCE |
| 892 E. Highway 12* | TCE |
| 947 Bakken Road | TCE |
| 948 LaBarge Road* | TCE |

*Note: Well has since been replaced with a clean Jordan well.

Table 4-2 presents the historical maximums for all compounds detected in the leachate and groundwater and compares them to the most recent findings. Historically only three VOCs have ever been at concentrations in the groundwater exceeding their ES. These compounds are TCE (maximum concentration 54 µg/l on 1/7/85 at 898 E Hwy. 12), PCE (17 µg/l on 11/26/84 at 890 E Hwy. 12), and vinyl chloride (14 µg/l on 9/24/91 at MW-6). In the recent samplings, PCE was detected at concentrations below its ES, and vinyl chloride was not detected.

Historical maximum concentrations of TCE and PCE are presented graphically on Figures 4-1b and 4-2b, respectively. Historically, one sampling occasion in one well sample, TCE concentrations have exceeded ES as far west as Bakken Road. This one time event occurred in a sample collected from 947 Bakken Road in January 1990. The TCE concentration in this sample was 5.2 µg/l. A comparison between the historical maximum concentrations for TCE and PCE with the concentrations present during the RI reveals that peak concentrations for the majority of the wells occurred prior to the RI. Additionally, the historical maximum TCE and PCE concentrations indicate a plume extent that is very similar to that shown by the RI data.

The most prominent VOCs presently in the landfill leachate (THF and total xylenes) have never been prominent in the groundwater. In fact, Table 4-3 shows that THF has never been detected in the groundwater, and total xylenes have been found only at low levels (maximum of 4.8 µg/l at MW-6 in September 1991).

Appendix Q presents time-concentration trends of two compounds representative of the groundwater plume (TCE and freon-11) in wells along the plume axis: MW-5 (at the landfill); 890 E Hwy. 12 (just south of the landfill); 756 and 792 Holden (mid-plume); and 947 Bakken (near the front of the plume). At the landfill (MW-5) both TCE and freon-11 have decreased since 1990. The decrease coincides with the capping of the landfill. At other locations, freon-11 has decreased fairly steadily since the mid-1980s, whereas TCE has decreased or held steady.

Based on available data, Table 4-3 lists all the compounds ever detected in the leachate, landfill gas, and groundwater. The data indicate that the compounds of main concern in the groundwater (TCE, PCE, freon-11, and freon-12) are likely to have originated from the landfill *gas*, rather than the leachate. Appendix H details the concentrations of compounds in the landfill gas. An in-depth analysis of the landfill gas-to-groundwater mass transfer concept is provided in Section 5.

After review of the historical RI data, TCE is the primary VOC of concern, with PCE, freon-11, and freon-12 being of a secondary concern.

4.3.1.2. Other Organics

Phthalates were the only SVOCs detected of the 64 tested. Phthalates were detected in two wells, WW-15A and MW-9, at estimated concentrations of 3 and 0.7 µg/l, respectively. The estimated concentration at WW-15A is equal to the ES of 3 µg/l. This detection is an isolated incident anomolus to the chemical characteristics of the groundwater quality in other wells.

Phthalates are commonly found as a result of well construction, sampling or analysis since they are plasticizers and could be associated with many items such as rubber gloves, etc. No PCB/pesticides were detected. Thus SVOCs and PCB/pesticides are not of concern at this study area.

4.3.1.3. Metals

Metals were analyzed at six monitoring wells (MW-3, MW-5, MW-9, WW-11, WW-13 and WW-15A) and three residential wells (786 McCutcheon, 963 LaBarge and 980 County Road A). Three of the monitoring wells (MW-3, WW-11 and WW-13) were tested for "dissolved" (filtered) metals in addition to "total" (unfiltered) metals to determine if a significant difference prevailed. The residential samples were tested for total metals only since drinking water standards are based on total analyses. Total concentrations represent the dissolved and suspended metal particles in the groundwater.

Of the 19 metals analyzed only six were typically detected. These were iron, manganese, barium, copper, lead and zinc. Total chromium and total nickel were detected at WW-13 during the second round only. The dissolved fraction of these metals were non-detect. Total aluminum was detected at WW-13 during both rounds, but the dissolved fraction was also non-detect. Total aluminum was also detected during the second round at WW-11 and residential well 963 LaBarge. Total aluminum was not detected at WW-11 and 963 LaBarge during the first event.

Only lead, iron and manganese exceeded their respective ES. Lead exceeded the health-based ES of 15 µg/l in one sample during round 1, at MW-5 (28 µg/l) next to the landfill. Lead was non-detect at all landfill monitoring locations (including MW-5) during the second sampling event. Iron was present at most locations above the secondary ES. Total manganese also exceeded the secondary ES at two locations. Although iron and manganese concentrations are typically high in landfill leachate samples, high iron and manganese also occurs naturally in the groundwater in this area (see WW-11 on Table 4-1). The PAL for chromium (10 µg/l) was exceeded in the second round of samples collected from WW-13 and 980 County Road A, which had concentrations of 52.2 µg/l and 16.5 µg/l, respectively. The first round samples from these wells were "non-detect" for chromium. The concentration of copper in the first round sample from WW-11, 826 µg/l, exceeded the PAL of 130 µg/l.

With the exception of iron, there were no significant differences between total and dissolved metals concentrations. Manganese, copper and aluminum exhibited some minor variability in one or two of the samples. Iron typically exhibits a large difference between total and dissolved fractions in a non-reducing (aerobic) groundwater environment since most of the "total" concentration would then be attributed to particulate forms of this metal rather than the dissolved form. Total copper was also detected in all residential wells sampled, possibly reflecting copper piping in the homes. *not if flushed for 15 minutes*

Metals are not a significant concern in the groundwater across the study area. Iron and manganese do not have health based standards and their concentrations in the groundwater are at least partly natural. Lead exceeded the ES in only one sample from one well next to the landfill, and lead in the second round sample from the same well was non-detect.

4.3.1.4. Major Cations

In the groundwater immediately about the landfill the cationic composition is predominantly calcium-magnesium (greater than 90 percent of total cations) with low sodium and potassium proportions. The landfill wells tested (MW-3, MW-5, MW-9 and WW-13) have the same cationic fingerprint as the upgradient well WW-11 (Appendix P). However, this is in stark contrast to the cationic fingerprint of the leachate, in which sodium ions represent greater than 50 percent of the total major cations. This contrast in cationic proportion is a strong indication that the leachate is not impacting groundwater directly beneath the landfill to a significant degree. If leachate had a significant impact on the water quality, then a shift to a greater sodium proportion (along with an elevated cationic concentration) would be observed; but such is not the case. At WW-15A located 2-miles downgradient of the landfill, the cation proportions differ from landfill monitoring locations, upgradient monitoring wells and leachate. In WW-15A the proportions of calcium, magnesium and sodium are approximately equal. However, the total cationic concentration is low, not indicative of impacted groundwater.

4.3.2. Extent of Groundwater Contamination

The area that exceeds the ES for TCE extends 1.5 miles downgradient and is approximately ½ mile wide (see Figure 4-1a). The most downgradient detections above the ES are in residential wells located near LaBarge Road (within about 1,000 feet north of McCutcheon Road at the northern boundary and 2,500-3,000 feet north of Highway 12 at the southern boundary). Levels of TCE ranged in concentration from a maximum of 28 µg/l at a residential well roughly 1,000 feet sidegradient (south) of the landfill, to less than 1 µg/l or non-detect downgradient (northwest) in the vicinity of County Road A.

The distribution of PCE appears well correlated with TCE (compare Figures 4-2a and 4-1a). Freon-11 and freon-12 (Figures 4-3 and 4-4), however, seem to be sporadically distributed across the study area, with concentrations only slightly correlated with TCE. Freon concentrations also appear to be highly variable with time (compare round 1 and round 2 results at WW-12 and 932 LaBarge). Note that the highest concentration of freon-12 is located hydraulically upgradient of the landfill at WW-12.

The vertical extent of contamination appears to be confined to the Prairie du Chien. To date no contaminants have been detected in the groundwater of the underlying Jordan Sandstone (reference Appendix N). Seven Jordan wells located within the plume area were sampled in August/September 1994. These wells are:

| | |
|---------------------|-----------------|
| 771 McCutcheon Road | 772 Holden Lane |
| 766 Holden Lane | 779 Holden Lane |
| 812 McCutcheon | 892E Highway 12 |
| 948 LaBarge Road | |

Concentrations of TCE are slightly stratified in the Prairie du Chien beneath the landfill at nested wells MW-9 and MW-10, as illustrated by TCE concentrations of 4 and 1 µg/l, respectively.

Approximately 2 miles downgradient from the landfill near Bakken Road, the concentrations are consistent with depth, as WW-15A, B, C (representing shallow, intermediate, and deep Prairie du Chien water quality) and residential wells along Bakken (947, 954, 957, 961, 962) have TCE concentrations of 4 µg/l or less. These residential wells are screened in the upper portion of the

Prairie du Chien. The residential wells in the vicinity of LaBarge Road, approximately 5,000-7,000 feet downgradient also do not exhibit a stratification of concentration. Note the TCE concentrations and depths at the following wells in the vicinity of LaBarge Road: 795 McCutcheon (6.9 µg/l at 120 feet bgl); 932 LaBarge (13 µg/l at 141 feet bgl); and 792 Holden Lane (6.8 µg/l at 250 feet bgl).

Based on a plume-averaged concentration of 4 µg/l, plume dimensions of 2 miles by $\frac{3}{4}$ mile by 200 feet, and effective porosity of 0.06 for the Prairie du Chien (Delin, 1994), the total quantity of TCE in the groundwater is equal to 10 gallons, or 120 pounds.

Using the information presented in Section 3 (a hydraulic conductivity of 34 feet/day and gradient of 0.004 feet/foot) with the plume-averaged TCE concentration and plume dimensions given above, the flux of TCE in the groundwater is approximately 10 lb/yr (about 1 gallon.)

SECTION 5 - CONTAMINANT FATE AND TRANSPORT

The findings and conclusions from the RI are used here as a basis for an analysis of the fate and transport of VOCs, the contaminants of concern in the groundwater. The mechanisms by which VOCs migrate in the various media (landfill leachate, landfill gas, groundwater), and the VOCs' ultimate fate are discussed below.

5.1. POTENTIAL ROUTES OF MIGRATION

From their original placement in the refuse mass, contaminants may migrate after dissolving in leachate or (in the case of VOCs) in landfill gas. Figure 5-1 illustrates the various potential migration routes. Contaminants in the leachate may be removed intentionally or may move downward through the unsaturated zone to the water table. At the Junker site the water table lies about 50 feet below the base of the refuse, and in some parts of the landfill the "downward" movement of leachate entails lateral detours imposed by natural low-permeability layers in the subsurface. Contaminants in the groundwater are carried in a generally west-northwesterly direction toward the Willow River, into which the groundwater discharges. Residential wells in the Prairie du Chien Aquifer between the landfill and the river intercept a portion of the groundwater contaminants. Along the leachate-groundwater migration path, some organic contaminants biodegrade or volatilize. Both anaerobic and aerobic biodegradation is possible, with different biodegradation products resulting from the two types of process (see Section 5.2).

VOCs enter the landfill gas either directly by evaporation from pockets of organic material in the refuse, or indirectly by volatilization from the leachate. The active landfill gas removal system extracts most of the landfill gas, and the system's flare destroys nearly all of the extracted VOCs. Some VOCs may escape the gas removal system and migrate laterally through the soil; there is evidence for this particularly south of the landfill. A portion of such VOCs could dissolve directly into the groundwater or dissolve in rainwater infiltrating through the soil, and by this route eventually enter the groundwater, perhaps even at an off-site location; the remainder would ultimately disperse.

5.2. CONTAMINANT PERSISTENCE

While some organic contaminants readily biodegrade in soil and water, others persist in these media for long periods. Similarly, VOCs in the atmosphere are subject to chemical reactions induced by light and by other atmospheric constituents. The "half-life" of an organic contaminant gages the contaminant's persistence in the environment that results from the above and other processes.

Table 5-1 lists suggestive half-life data for the predominant VOCs in the groundwater and leachate. The data are qualified as "suggestive" because half-lives of organic compounds are extremely variable due to a great variety of factors. The data suggest the following generalizations: (1) the chlorinated compounds (TCE, PCE, freon-11, and freon-12) are moderately persistent in soil and groundwater, with half-lives ranging up to a few years; (2) the xylenes are relatively short-lived in soil and groundwater, with half-lives ranging from a few days to one year; and (3) in the atmosphere the freon-11 and freon-12 are extremely persistent, whereas the other compounds are not.

In a general sense points (1) and (2) above fit with what has been observed in the groundwater at the study area. The chlorinated compounds have proven to be persistent, especially TCE, as shown in the concentration trends given in Appendix Q. By contrast, xylene appears to be short-lived, as it was detected in the groundwater early on (4.7 µg/l in 12/90 at MW-4 and 4.8 µg/l in 9/91 at MW-6) but is no longer present above detection levels.

Despite the general persistence of TCE in the groundwater, the virtually stationary nature of the TCE plume is strong evidence that "loss mechanisms" such as biodegradation and volatilization operate. The extent of the TCE plume changed hardly at all between the mid-1980s, when the WDNR sampled extensively throughout the area, and the 1994-1995 RI and residential well samplings. The almost stationary nature of the plume during this 10-year period must be reconciled with its initial expansion throughout a large area, beginning no earlier than 1972. Loss mechanisms, coupled with a relatively steady source, provide the only reasonable reconciliation.

Although the products of the anaerobic TCE biodegradation sequence (dichloroethenes and vinyl chloride) are not prominent in the groundwater, aerobic biodegradation may be occurring. The products of the latter include epoxides, alcohols and carbon dioxide (Semprini et al., 1990; Vogel et al., 1987) which are generally non-regulated and non-hazardous.

5.3. CONTAMINANT MIGRATION

5.3.1. General

Table 5-2 lists physical parameters for the above organic compounds that influence their transport in the environment. All of the compounds have water solubilities many times higher than their maximum observed concentrations in groundwater and leachate; thus, water solubility does not directly limit subsurface transport of these compounds. The vapor pressures and Henry's Law constants indicate that all of these compounds are fairly volatile, as well. The two freon compounds, in fact, are among the most volatile of all organic compounds.

The organic carbon-based partition coefficients for these compounds indicate significant retardation of their transport through the unsaturated soils. However, retardation is probably not significant in the groundwater flow because of the nature of the aquifer material (fractured and solution-channeled dolomite). The groundwater flows in a generally west-northwesterly direction with an estimated mean velocity of 850 feet per year (see Section 3.7). This velocity estimate also applies to non-retarded contaminants.

Observations in December 1984 of measurable TCE concentrations in wells along Bakken Road, about 2 miles from the landfill, agree in a general sense with the above non-retarded contaminant velocity estimate. It is not known if the detections along Bakken Road in 1984 represented the first arrival of the plume or the middle of the front (which travels at the mean velocity).

Moreover, the transport of TCE from the refuse to the groundwater must also be accounted in the total travel time to Bakken Road. Nonetheless, a velocity of 850 feet per year implies a travel time of 12 years from the landfill to Bakken Road, which accords with the start of operation of the landfill in 1972.

5.3.2. Landfill Gas Impacts on Groundwater

VOC concentrations observed during the RI in the groundwater near the landfill and in leachate were comparable with equilibrium concentrations implied by the Henry's Law constants in Table 5-2 and VOC concentrations in the landfill gas as monitored at the flare inlet. The maximum VOC concentrations observed in leachate and groundwater during the RI are compared in Table 5-3 with theoretical concentrations based on equilibrium with the landfill gas at the flare inlet. Temperature variations, heterogeneity of the waste, and other complicating factors are ignored here. Maximum leachate concentrations for the freons and xylenes agree within a factor of two with the theoretical equilibrium concentrations. TCE and PCE concentrations in the leachate were within an order of magnitude of their theoretical equilibrium concentrations in water.

The maximum groundwater concentration for TCE detected during the RI occurred in the area south of the landfill and was 28 $\mu\text{g/l}$ — also within an order of magnitude of the theoretical equilibrium concentration. Moreover, there is evidence that VOC concentrations in the landfill gas near the southeast boundary of the landfill are much higher (possibly several orders of magnitude higher) than the average levels as measured entering the flare (see Section 4.1.2). These higher concentrations may account for the fact that a gas TCE concentration of about 1900 ppbv (2.4 times the flare-inlet concentration of 800 ppbv) would be required for the gas to be at equilibrium with the maximum groundwater TCE concentration of 28 $\mu\text{g/l}$ as observed to the southeast of the landfill. The historical groundwater maximum (also southeast of the landfill) would have required about five times the flare-inlet concentration in the gas. The required TCE concentration ranges for the landfill gas suggested by observed and historical groundwater concentrations are well within the concentrations implied by the headspace readings at WB-3 off of the southeast corner of the landfill (see Section 4.1.2). These findings suggest that landfill gas that escapes and migrates southward from the landfill (see Section 4.1) conveys TCE to this vicinity, where infiltrating precipitation then transports it to the groundwater or the TCE dissolves directly into the groundwater. This situation is not unique to the Junker Landfill. The transport of VOCs to groundwater by gas migration has been reported in other landfill cases (Kerfoot and Prattke, 1992; Morris, 1995, see Appendix R).

The Junker landfill gas contains a number of VOCs that have not been detected in the groundwater; this may result from localized variability within the landfill of the gas constituents, differences in Henry's Law constants, or other factors. Other cases where landfill gas migration has carried VOC to the groundwater also show a similar absence in the groundwater of certain VOCs that are in the gas (Kerfoot and Prattke, 1992).

Since inorganic indicators (major cations) show that leachate has little direct impact on the groundwater (see Section 4), and since leachate concentrations of VOCs appear to be too low to be the sole cause of the highest concentrations observed south of the landfill, it appears that landfill gas migration is the primary mechanism for the transport of TCE and other VOCs to the groundwater. Landfill gas generation, however, can in some cases be promoted by the presence of leachate.

5.3.3. TCE Mass Flux Comparison

The total mass flux of TCE was estimated in Section 4 for three migration pathways as follows:

| Pathway | Flux (pounds per year) |
|-------------------------|-----------------------------------|
| Gas Extraction System | 44 |
| Groundwater | 10 |
| Leachate | 0.01 |
| Total Quantified Fluxes | 54 |

By far the largest flux is through the landfill gas extraction system, accounting for three quarters of the total quantified fluxes. The flux through the groundwater plume represents the remaining one quarter. The leachate flux is negligible.

The groundwater plume must have a TCE source-flux approximately equal to the groundwater flux given above. A fairly steady source-flux south of the landfill is required to explain the persistence and approximate steadiness of the plume's maximum TCE concentrations at that

persistence and approximate steadiness of the plume's maximum TCE concentrations at that location. In light of the above, escaped landfill gas could very plausibly provide this source-flux; and in fact there appears to be no alternative. The observed southward migration of landfill gas in the subsurface explains the translocation of the highest TCE concentrations approximately 1,000 feet away from the landfill.

It appears then that the landfill gas extraction system is at present approximately 80 percent effective for TCE, capturing 44 of the 54 pounds per year of the total TCE flux.

SECTION 6 - RISK AND ECOLOGICAL ASSESSMENTS

As part of strategy set forth in the Work Plan, this remedial investigation was not intended to present a full risk assessment or ecological assessment. However, Appendix S contains memorandas by USEPA and Wisconsin Division of Health (WDH) staff pertaining to ecological and human health risks associated with this site, respectively.

The USEPA memorandum (Eileen Helmer, December 22, 1993) states:

The documents which you supplied indicate that there are no surface water or soil exposure routes for contaminated materials in this now covered landfill. If in fact no such exposure pathways exist, this site does not pose significant ecological threats, especially in light of the fact that ground water contamination is low from an ecological standpoint.

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The WDH memorandum (Chuck Warzecha, January 25, 1994) concludes:

- *Short-term exposure to the highest concentrations of VOC contamination in private wells is not expected to cause adverse health effects.*
- *Drinking private well water every day over a lifetime containing TCE and PCE at the highest concentrations detected in private wells could pose an increase cancer risk.*
- *Inhalation and dermal adsorption of these contaminants could contribute a significant additional increased cancer risk.*

The findings of the RI support the USEPA and WDH conclusions. The significant exposure pathways at this site are associated with gas migration and groundwater as previously discussed. In addition, the RI walkover identified a small seep of apparent leachate next to the northern most sedimentation pond. The sedimentation pond is in a closed basin, and any surface water impacted by the seep would be retained on-site. If this seep is leachate, it is possible that it poses an ecological threat to local plants and animals which may use the pond. Seep(s) will be further evaluated as part of the on-going operation and maintenance program.

In response to the environmental risks associated with the site, the WDNR has implemented several remedies to minimize potential impacts to human health and the environment. To prevent human ingestion of contaminated groundwater, institutional controls (the Special Well Construction Area and bottled drinking water supplied by the Group) have been put into effect for the residents over the plume area. Further, there is an active groundwater monitoring network in place across the study area. Samples collected from the network are compared with WDNR groundwater standards, which are health based, and are used to assess the extent and magnitude of impacted groundwater. Landfill gas migration is impeded by use of an active venting system and the gas collected is destroyed at a flare. Finally, access to the site is restricted by fencing.

Additional remedies to further control environmental risks associated with the site will be identified and evaluated as part of the FS process.

SECTION 7 - SUMMARY AND CONCLUSIONS

All of the data objectives set forth in the Work Plan and summarized here in Section 1.3 were accomplished during the RI. Therefore, no further data collection as part of the RI is deemed necessary. The facts and interpretations presented in this report will form the foundation of the forthcoming Feasibility Study (FS). Dependent upon the remedy or remedies selected as part of the FS process, additional data, specific for final design, may need to be collected such as soil gas for VOCs. The following are the findings and conclusions of the RI.

- **LANDFILL CAP**

- Vertical permeability tests conducted on the existing cap indicate the cap is in good condition.
- Delineated on the cap were eleven low areas of settlement which comprise a total area of 0.4 acre.
- A small area of uncapped refuse (3,700 square feet) was found along the northwestern edge of the landfill.
- The landfill cap is over 99 percent efficient in preventing precipitation from entering the landfill, allowing only 89,000 gallons of precipitation per year to seep through.
- There is an apparent leachate seep present adjacent to the northern most sedimentation basin pond.

- **LEACHATE**

- The total volume of leachate in the landfill is estimated to be between 5 and 10 million gallons.
- There appears to be a 1.3-gallon-per-minute source (683,000 gallons per year) of focused recharge near the southeast boundary of the landfill.
- The focused recharge source is much greater in magnitude than the total rate of infiltration through the landfill cap.
- Xylenes and tetrahydrofuran are the most prominent VOCs in the leachate.
- During the RI, TCE, PCE, freon-11, and freon-12 were not detected in the leachate at a detection limit of 5 micrograms per liter. Previous samplings showed TCE and PCE at 1 to 2 micrograms per liter and freon-12 at 6.6 micrograms per liter; freon-11 has never been detected.
- A total of less than 0.1 pound, or 2 tablespoons, of TCE is present in the leachate.
- Less than 0.01 pound of TCE, or 0.2 tablespoon, per year is carried out of the landfill by escaping leachate.
- Hydraulic conductivity of the refuse material ranges from less than 1 foot per day (at three locations) to 27 feet per day (at one location) and had a geometric mean of 2 feet per day.
- The refuse in the landfill yields low leachate pumping rates.

- **LANDFILL GAS**

- Petroleum-based compounds and chlorinated solvents are the VOCs at highest concentrations in the landfill gas. The chlorinated solvents include TCE, PCE, freon-11, and freon-12; the VOCs of main concern in the groundwater.
- Petroleum-based compounds account for over 85 percent of the VOC mass in the landfill gas.
- The leachate buildup in the southeastern corner of the landfill enhances the generation of landfill gas.
- The gas extraction system removed nearly 4,000 pounds of VOCs, including 44 pounds of TCE from the landfill in 1994.
- The VOCs collected by the extraction system are efficiently destroyed at the flare. Emissions from the flare are two to six orders of magnitude below the required standards.
- The gas extraction system is not adequate in the southeastern corner of the landfill.
- Breakthrough of landfill gas, at concentrations above the lower explosive limit of methane, occurs between GEW-8 and GEW-9 and continues south over 1,000 feet.

- **GEOLOGY**

- No major erosional features were found in the top of the Prairie du Chien, though the topography and local well logs suggest sinkholes (dissolutional features) may be present.
- Remnants of the St. Peter Sandstone on top of the Prairie du Chien were common at drilling locations near the landfill.

- Subsurface features near the landfill, such as silt layers, control the off-site migration of landfill gas.

- **HYDROGEOLOGY**

- The water table beneath the study area is in the Prairie du Chien Formation. This formation is composed of limestone and dolomite and is overlain by up to 100-feet of glacial sediments, mainly sand and gravel and clay, or locally, remnants of the St. Peter Sandstone.
- Regionally groundwater flow is to the west-northwest toward the Willow River, which has a major influence on groundwater flow across the area.
- Slug tests conducted locally at two monitoring wells yielded an average hydraulic conductivity value of 21 feet per day ($7.4\text{E-}3$ cm/s), consistent with the literature value for the Prairie du Chien's hydraulic conductivity of 34 feet per day ($1.2\text{E-}2$ cm/s).
- Based on the reported regional hydraulic conductivity, the average velocity of groundwater in the plume is 850 feet per year.
- Approximately 750 gallons per minute of water is flowing through the study area.
- On average, vertical flow is downward in the vicinity of the landfill and appears to be upward further to the west (Bakken Road) and closer to the Willow River.

- **GROUNDWATER QUALITY**

- Generally speaking there is a decreasing trend in VOC concentrations across the plume near the landfill, and an increasing trend of low concentration near County Road A.
- Current VOC detections in the groundwater indicate a plume geometry (shape and extent) consistent with data collected since 1984 which suggests that plume has reached a nearly stationary state.
- VOCs in the groundwater are subject to biodegradation, volatilization, or other "loss mechanisms"; these mechanisms are in part responsible for the slow-changing, nearly stationary character of the VOC plume.
- The presence of leachate in the waste mass does not represent a threat to groundwater quality.
- The occurrence of the highest VOC concentrations in groundwater south of the landfill (sidegradient) appears to be due to the lateral migration of landfill gas and the subsequent dissolution of VOCs in infiltrating rainwater.
- TCE has been detected in the groundwater across the study area at concentrations above the Wisconsin Department of Natural Resources' Enforcement Standard (ES) of 5 µg/l.
- Based on the most recent analytical data, fifteen residential wells have TCE concentrations above the ES. Historically, up to seventeen residential wells have had TCE concentrations above the ES.

- On one occasion (January 1990) one well on Bakken Road exceeded the ES for TCE in the groundwater. Since that 1990 sampling event, neither this well nor any other well on Bakken Road has exceeded the ES.
- The most downgradient locations at which any health-related ES are currently exceeded are along LaBarge Road and McCutcheon Road.
- Currently, twenty nine residential wells may have concentrations of TCE above the PAL, but less than the ES.
- Although at low levels, a total of 18 different VOCs were detected in the groundwater, mainly at the landfill wells. The most common compounds detected were TCE, PCE, freon-11 and freon-12.
- Pesticides and PCBs were not detected in the groundwater samples. Low concentrations of phthalates (plasticizers) were detected at two wells near the landfill.
- Though most metal analytes were not detected, the concentration of lead in one sample from round 1 exceeded the ES of 15 µg/l (landfill well MW-5 at 28 µg/l). However, lead was not detected in the round 2 sample from this well.
- Iron and manganese have generally high concentrations across the plume, but this may be due to naturally occurring conditions.

SECTION 8 - REFERENCES

- Ayres, *Critical Analysis of Braun Report Concerning VOC Contamination in the Green Mill Lane/Trout Brook Road/Parkview Estates Area*. June 1992.
- Borman, R.G., Ground Water Resources and Geology of St. Croix County, Wisconsin. USGS Information Circular Number 32, 1976.
- Bouwer, H., "The Bouwer and Rice Slug Test-An Update", Ground Water, v.27, n.3, 1989. pp.304-309.
- Braun Intertech Environmental, Inc., *In-Field Report, Troutbrook Road/Parkview Estates Area* prepared for the State of Wisconsin, Department of Natural Resources. April 1992
- CWE, *Junker Landfill Focused Remedial Option Plan*. April 1989.
- CWE, *Clay Source for Junker Landfill Remedial Action Project*. June 1989.
- CWE, *Specifications for Junker Landfill Remedial Action Project*. July 1989.
- CWE, *Junker Landfill No. 1972, Town of Hudson, St. Croix County, Wisconsin, Well Construction Report*. January 1990.
- CWE, *Construction Documentation for Junker Landfill Remedial Action Project*. December 1990.
- CWE, *Groundwater and Gas Monitoring Report to WDNR for Junker Landfill*. January 1993.
- Delin, G., Personal communication (telephone) with Wenck staff. April 4, 1994.
- Driscoll, Ground Water and Wells, Johnson Division, VOP Inc., Saint Paul, Minnesota. 1975. 440p.
- Fetter, C.W., Applied Hydrogeology, Merrill Publishing Company, Columbus, Ohio. 1988. 592p.
- Freeze, R. A. and Cherry, J.A. Groundwater, Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1979.
- Gas Control Engineering, *Report of Evaluation and Oversight of Operation and Maintenance at the Junker Landfill*, prepared for Junker Landfill Group. October 1994.
- Hogberg, R.K., Geology of Minnesota: A Centennial Volume, 1972. pp 595-602.
- Kerfoot, H.B., and Prattke, M.J., *False Positive Indications of Leachate Effects on Ground Water*

Due to the Use of Volatile Organic Compounds as Indicator Parameters: A Field Study of Gas Migration, in Proc. 6th National Outdoor Action Conf., May 11-13, 1992, Las Vegas, National Ground Water Association, 1992.

Lyman, W.J., Reehl, W.F. and Rosenblatt, D.H., Handbook of Chemical Property Estimation Methods. McGraw-Hill, New York. 1982.

Mackay, D., Wan Ying Shiu, and Kuo Ching Ma, Illustrated Handbook of Physical-Chemical Properties and Environmental Fate for Organic Chemicals. Three volumes. Lewis Publishers, Boca Raton. 1993.

Morris, H.M., *The Potential for Landfill Gas to Impact Ground Water Quality*, in Proc. 9th National Outdoor Action Conf., May 2-4, 1995, Las Vegas, National Ground Water Association, 1995.

Norvitch, R.F., Ross, T.G., and Brietkrietz, Water Resources Outlook for the Minneapolis-Saint Paul Metropolitan Area, U.S.G.S. and the Metropolitan Council of the Twin Cities Area. 1973.

Ojakangas and Matsch, Minnesota's Geology. University of Minnesota Press, Minneapolis, Minnesota. 1982.

Owen Ayres and Associates, *Landfill Land Company Sanitary Landfill Original Design Plans*. 1975.

Press, W., Flannery, B., Teukolsky, S., Vetterling, W., Numerical Recipes, Cambridge University Press, New York. 1988. 818p.

Semprini, L., Roberts, P.V., Hopkins, G.D., and McCarty, P.L., *A Field Evaluation of In-Situ Biodegradation of Chlorinated Ethenes: Part 2, Results of Biostimulation and Biotransformation Experiments*, Ground Water, v.28, n.5, 1990.

Strack, O.D.L., Groundwater Mechanics, Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1989, 732p.

U.S. Department of the Interior. Study and Interpretation of the Chemical Characteristics of Natural Water. Geological Survey Water-Supply Paper 1473. United States Government Printing Office, Washington. 1970.

U.S. Environmental Protection Agency. Superfund Public Health Evaluation Manual, EPA/540/1-86/060. 1986.

U.S. Environmental Protection Agency, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. (EPA/540/G-89/004, OSWER Directive 9355.3-01). October 1989.

- U.S. Environmental Protection Agency, *Site Assessment Report for Junker Landfill*. April 1994.
- USEPA Region V. *Interoffice letter, Junker Landfill, Hudson, Wisconsin, Potential Ecological Risks*. January 1993.
- Verschueren, K. Handbook of Environmental Data on Organic Chemicals. Second edition. Van Nostrand Reinhold, New York. 1983.
- Vogel, T.M., Criddle, C.S., and McCarty, P.L., *Transformations of Halogenated Aliphatic Compounds*, Env. Sci. & Tech. v.21, pp.722-736, 1987.
- Wenck Associates, Inc., *Junker Landfill, Technical Review and Evaluation, Summary Report prepared for the Junker Landfill Group*. May 1994.
- Wenck Associates, Inc., *Residential Well Sampling Report, Hudson, Wisconsin prepared for Junker Landfill Group*. October 1994
- Wenck Associates, Inc., *Remedial Investigation Work Plans, Junker Landfill, Hudson, WI prepared for the Junker Landfill Group*. December 1994 - Revised January 31, 1995.
- Wisconsin Department of Health, *SACM Health Consultation Report*, prepared for USEPA Region V. January 1994 .
- Young, H.L., and Hindall, S.M., Water Resources of Wisconsin, St. Croix River Basin, Hydrologic Investigations Atlas HA-451. United States Geological Survey, Richmond, Virginia. 1973.

**Table 2-1: Summary of Private Property Access
Junker Landfill - Hudson Township, Wisconsin**

| Property Owner/Contact | Activity Location | Activity |
|--|-------------------------------------|--|
| Cherl Inc/ <u>Sauer</u> <i>Saver</i> | Landfill | All Site Activities |
| O'Malley | 905 Highway 12 | Monitoring Well WW-11 |
| Stolberg | Parcel East of Landfill | Monitoring Well WW-12 |
| Hetchler | Parcel Northwest of 892E Highway 12 | Monitoring Well WW-13 Geoprobe GP-2RES & GP5RES |
| Spott | 942 Alexander Rd. | Monitoring Well WW-14 |
| Bakken | 947 Bakken Rd. | Monitoring Wells WW-15A, WW-15B & WW15C |
| Spear/Bast | 948 LaBarge | Monitoring Well WW-16 |
| Jim Richardson | Nor Lake | Geophysical Survey Groundwater Sampling |
| CNW Transportation Company /Greenland | Railroad R-O-W | Soil Boring Geoprobe Sampling |
| Town of Hudson/Horne | LaBarge Road R-O-W | Geophysical Survey |
| Dabruzzo | 954 Bakken Rd. | Geophysical Survey |
| Skoviera | 961 Bakken Rd. | Geophysical Survey |
| Powers | 957 Bakken Rd. | Geophysical Survey |
| Anderson | 962 Bakken Rd. | Geophysical Survey |
| Oleson | 970 Bakken Rd. | Geophysical Survey |
| Ramlet | 695 McCutcheon Rd. | Geophysical Survey |
| Wadsworth | 892E Highway 12 | Geoprobe GP-1RES Gas Monitoring Well GMW-4A & 4B Methane Monitor |
| Crownhart | 890E Highway 12 | Geoprobe GP-3RES Methane Monitor |
| Loftus | 888E Highway 12 | Geoprobe GP-4RES Methane Monitor |
| Stockey | 898E Highway 12 | Methane Monitor |

**Table 2-2: Soil Testing Results for Landfill Cap
Junker Landfill - Hudson Township, Wisconsin**

| Sample ID | Soil Layer | Date | Time | Layer Depth (ft) | Hydraulic Conductivity (cm/s) | ATTENBERG LIMITS (%) | | Percent (3) Passing #200 | Percent Passing 0.005mm | USCS | NUCLEAR METHOD (4) | | Moisture Content % | Percent Compaction (5) | Comment |
|---------------------|--------------|-----------|----------|---------------------------------------|-------------------------------|----------------------|---------|--------------------------|-------------------------|------------|-----------------------|-----------------------|--------------------|------------------------|-------------------------|
| | | | | | | LL | PI | | | | Dry Density (lb/ft^3) | Wet Density (lb/ft^3) | | | |
| WDNR Standard (1,2) | | | | 0.5 (topsoil) 1.5-2.5 (cover soil) | max. 1x10^-7 (clay) | min. 30 | min. 15 | min. 50 (clay) | min. 25 (clay) | | | | | min. 90 (clay) | |
| 1 | Topsoil | 15-Dec-94 | | 0.5 | | | | | | | | | | | |
| 1 | Cover soil | 15-Dec-94 | | 2.3 | 2.1 x 10^-3 | | | 12.2 | | SP-SM | | | | | |
| 1 | Clay barrier | 15-Dec-94 | 12:55 PM | | 6.7 x 10^-9 | 41.6 | 25.5 | 69.9 | 36 | CL | 105.3 | 127.5 | 21.1 | 88.9 | |
| 2 | Topsoil | 16-Dec-94 | | 0.8 | | | | | | | | | | | |
| 2 | Cover soil | 16-Dec-94 | | 2.3 | 7.0 x 10^-4 | | | 15.4 | | SM | | | | | |
| 2 | Clay barrier | 16-Dec-94 | 10:03 AM | | 2.6 x 10^-9 | 41.1 | 25.5 | 76.2 | 38 | CL | -- | -- | -- | -- | 3" ponding |
| 3 | Topsoil | 16-Dec-94 | | 0.6 | | | | | | | | | | | |
| 3 | Cover soil | 16-Dec-94 | | 2 | 9.1 x 10^-3 | | | 12.1 | | SP-SM | | | | | |
| 3 | Clay barrier | 16-Dec-94 | 09:40 AM | | 4.3 x 10^-9 | 42.1 | 26.3 | 73.7 | 38.2 | CL | 102.3 | 122.1 | 19.4 | 86.3 | |
| 4 | Topsoil | 16-Dec-94 | | 0.8 | | | | | | | | | | | |
| 4 | Cover soil | 16-Dec-94 | | 2 | 2.5 x 10^-3 | | | 8.8 | | SP-SM | | | | | |
| 4 | Clay barrier | 16-Dec-94 | 11:55 AM | | 5.6 x 10^-9 | 43.1 | 26.2 | 74.4 | 38 | CL | 98.8 | 123.8 | 25.3 | 83.4 | |
| 5 | Topsoil | 16-Dec-94 | | 1.3 | | | | | | | | | | | |
| 5 | Cover soil | 16-Dec-94 | | 2.3 | 9.2 x 10^-3 | | | 22.1 | | SM, ML, SP | | | | | 1-4" dia. rocks |
| 5 | Clay barrier | 16-Dec-94 | 11:43 AM | | 3.0 x 10^-9 | 42.4 | 26.3 | 76.9 | 40 | CL | 101.1 | 124.0 | 22.7 | 85.3 | |
| D1 | Topsoil | 15-Dec-94 | | 0.5 | | | | | | | | | | | |
| D1 | Cover soil | 15-Dec-94 | | 1.8 | | | | | | | | | | | |
| D1 | Clay barrier | 15-Dec-94 | 12:30 PM | | | | | | | | 105.3 | 126.7 | 20.3 | 88.9 | |
| D2 | Topsoil | 16-Dec-94 | | 0.8 | | | | | | | | | | | |
| D2 | Cover soil | 16-Dec-94 | | 2.2 | | | | | | | | | | | |
| D2 | Clay barrier | 16-Dec-94 | 10:00 AM | | | | | | | | 100.0 | 128.3 | 28.3 | 84.4 | seepage from cover soil |
| D3 | Topsoil | 16-Dec-94 | | 0.8 | | | | | | | | | | | |
| D3 | Cover soil | 16-Dec-94 | | 1.9 | | | | | | | | | | | |
| D3 | Clay barrier | 16-Dec-94 | 10:20 AM | | | | | | | | 103.9 | 127.1 | 22.3 | 87.7 | moist surface |
| D4 | Topsoil | 16-Dec-94 | | 0.6 | | | | | | | | | | | |
| D4 | Cover soil | 16-Dec-94 | | 2.2 | | | | | | | | | | | |
| D4 | Clay barrier | 16-Dec-94 | 10:45 AM | | | | | | | | 102.3 | 124.5 | 21.7 | 86.3 | |
| D5 | Topsoil | 16-Dec-94 | | 0.4 | | | | | | | | | | | |
| D5 | Cover soil | 16-Dec-94 | | 2.3 | | | | | | | | | | | |
| D5 | Clay barrier | 16-Dec-94 | 10:30 AM | | | | | | | | 103.9 | 126.3 | 21.6 | 87.7 | moist surface |

NOTE:

- LL Liquid Limit
 - PI Plasticity Index
 - 1 Wisconsin Department of Natural Resources (WDNR) requirement for final cover system design; S. NR 504.07, Wis. Adm. Code.
 - 2 Wisconsin Department of Natural Resources (WDNR) requirement for clay liner; S. NR 504.05, Wis. Adm. Code.
 - 3 Taken from grain size distribution curve.
 - 4 Depth of nuclear probe was one foot; Troxler 3440 nuclear density gauge calibrated in field for trench offset.
 - 5 Based on modified proctor density of 118.5 pcf from CWE December 1990 Construction Documentation report.
- Refer to Figure 2-3 for locations.

Table 2-2: Soil Testing Results for Landfill Cap
Junker Landfill - Hudson Township, Wisconsin

| Sample ID | Soil Layer | Date | Time | Layer Depth (ft) | Hydraulic Conductivity (cm/s) | ATTERBERG LIMITS (%) | | Percent (3) Passing #200 | Percent Passing 0.005mm | USCS | NUCLEAR METHOD (4) | | Moisture Content % | Percent Compaction (5) | Comment |
|---------------------|--------------|-----------|----------|---------------------------------------|-------------------------------|----------------------|---------|--------------------------|-------------------------|------|-----------------------|-----------------------|--------------------|------------------------|---------------|
| | | | | | | LL | PI | | | | Dry Density (lb/ft^3) | Wet Density (lb/ft^3) | | | |
| WDNR Standard (1,2) | | | | 0.5 (topsoil) 1.5-2.5 (cover soil) | max. 1x10^-7 (clay) | min. 30 | min. 15 | min. 50 (clay) | min. 25 (clay) | | | | | min. 90 (clay) | |
| D6 | Topsoil | 16-Dec-94 | | 0.8 | | | | | | | | | | | |
| D6 | Cover soil | 16-Dec-94 | | 2 | | | | | | | | | | | |
| D6 | Clay barrier | 16-Dec-94 | 09:50 AM | | | | | | | | 104.5 | 125.6 | 20.2 | 88.2 | |
| D7 | Topsoil | 16-Dec-94 | | 0.4 | | | | | | | | | | | |
| D7 | Cover soil | 16-Dec-94 | | 2 | | | | | | | | | | | |
| D7 | Clay barrier | 16-Dec-94 | 09:30 AM | | | | | | | | 106.4 | 128.5 | 20.8 | 89.8 | |
| D8 | Topsoil | 16-Dec-94 | | 0.6 | | | | | | | | | | | |
| D8 | Cover soil | 16-Dec-94 | | 2.2 | | | | | | | | | | | |
| D8 | Clay barrier | 16-Dec-94 | 01:12 PM | | | | | | | | 106.1 | 128.8 | 21.4 | 89.5 | |
| D9 | Topsoil | 16-Dec-94 | | 0.7 | | | | | | | | | | | |
| D9 | Cover soil | 16-Dec-94 | | 2.4 | | | | | | | | | | | |
| D9 | Clay barrier | 16-Dec-94 | 12:45 PM | | | | | | | | 106.3 | 128.0 | 20.4 | 89.7 | |
| D10 | Topsoil | 16-Dec-94 | | 0.4 | | | | | | | | | | | |
| D10 | Cover soil | 16-Dec-94 | | 1.6 | | | | | | | | | | | |
| D10 | Clay barrier | 16-Dec-94 | 11:30 AM | | | | | | | | 108.4 | 125.8 | 16.1 | 91.5 | |
| D11 | Topsoil | 16-Dec-94 | | 0.8 | | | | | | | | | | | |
| D11 | Cover soil | 16-Dec-94 | | 2.1 | | | | | | | | | | | |
| D11 | Clay barrier | 16-Dec-94 | 01:30 PM | | | | | | | | 105.7 | 127.4 | 20.5 | 89.2 | |
| D12 | Topsoil | 16-Dec-94 | | 0.8 | | | | | | | | | | | |
| D12 | Cover soil | 16-Dec-94 | | 1.8 | | | | | | | | | | | |
| D12 | Clay barrier | 16-Dec-94 | 01:20 PM | | | | | | | | 109.2 | 127.2 | 16.5 | 92.2 | |
| D13 | Topsoil | 16-Dec-94 | | 0.8 | | | | | | | | | | | |
| D13 | Cover soil | 16-Dec-94 | | 2.3 | | | | | | | | | | | |
| D13 | Clay barrier | 16-Dec-94 | 12:25 PM | | | | | | | | 99.2 | 123.2 | 24.2 | 83.7 | moist surface |
| D14 | Topsoil | 16-Dec-94 | | 0.8 | | | | | | | | | | | |
| D14 | Cover soil | 16-Dec-94 | | 2 | | | | | | | | | | | |
| D14 | Clay barrier | 16-Dec-94 | 01:00 PM | | | | | | | | 105.0 | 128.3 | 22.2 | 88.6 | |
| D15 | Topsoil | 16-Dec-94 | | -- | | | | | | | | | | | |
| D15 | Cover soil | 16-Dec-94 | | -- | | | | | | | | | | | |
| D15 | Clay barrier | 16-Dec-94 | 11:00 AM | | | | | | | | -- | -- | -- | -- | 1.5' ponding |

NOTE:

- LL Liquid Limit
- PI Plasticity Index
- 1 Wisconsin Department of Natural Resources (WDNR) requirement for final cover system design; S. NR 504.07, Wis. Adm. Code.
- 2 Wisconsin Department of Natural Resources (WDNR) requirement for clay liner; S. NR 504.05, Wis. Adm. Code.
- 3 Taken from grain size distribution curve.
- 4 Depth of nuclear probe was one foot; Troxler 3440 nuclear density gauge calibrated in field for trench offset.
- 5 Based on modified proctor density of 118.5 pcf from CWE December 1990 Construction Documentation report.

Refer to Figure 2-3 for locations.

Table 2-3: Leachate Elevation and Thickness
Junker Landfill - Hudson Township, Wisconsin

| Location | Date | Time | Ref. Elev. (1) (ft ngvd) | Base Elev. (ft ngvd) | Depth to Leachate (2) (ft) | Leachate Elevation (ft ngvd) | Leachate Column (ft) | Comments |
|----------|----------|----------|--------------------------------|----------------------------|----------------------------------|------------------------------------|----------------------------|-------------|
| LHW-1 | 12-13-94 | 09:00 AM | 1007.95 | 956.45 | 44.61 | 963.34 | 6.89 | |
| LHW-1 | 12-14-94 | 08:05 AM | 1007.95 | 956.45 | 46.04 | 961.91 | 5.46 | |
| LHW-1 | 12-14-94 | 08:07 AM | 1007.95 | 956.45 | 46.06 | 961.89 | 5.44 | wetted tape |
| LHW-1 | 2-9-95 | 12:05 PM | 1007.95 | 956.45 | 45.60 | 962.35 | 5.90 | wetted tape |
| LHW-2 | 12-13-94 | 08:50 AM | 1029.40 | 953.40 | 74.70 | 954.70 | 1.30 | |
| LHW-2 | 2-9-95 | 11:40 AM | 1029.40 | 953.40 | 74.60 | 954.80 | 1.40 | |
| LHW-3 | 12-13-94 | 08:30 AM | 1030.45 | 943.65 | -- | -- | 0 | dry |
| GEW-1 | 12-13-94 | 04:12 PM | 1025.68 | 952.83 | 72.37 | 953.31 | 0.48 | |
| GEW-2 | 12-13-94 | 04:32 PM | 1012.92 | 986.77 | 25.85 | 987.07 | 0.30 | |
| GEW-3 | 12-13-94 | 04:40 PM | 1000.72 | 954.99 | 43.94 | 956.78 | 1.79 | |
| GEW-4 | 12-13-94 | 04:23 PM | 1027.65 | 962.65 | -- | -- | 0 | dry |
| GEW-5 | 12-13-94 | 04:50 PM | 1001.26 | 957.49 | 43.32 | 957.94 | 0.45 | |
| GEW-5 | 12-14-94 | 08:00 AM | 1001.26 | 957.49 | 43.35 | 957.91 | 0.42 | |
| GEW-6 | 12-14-94 | 08:20 AM | 1008.51 | 958.51 | 49.38 | 959.13 | 0.62 | |
| GEW-7 | 12-13-94 | 11:40 AM | 1025.36 | 957.16 | 58.38 | 966.98 | 9.82 | clean |
| GEW-7 | 12-13-94 | 12:10 PM | 1025.36 | 957.16 | 58.35 | 967.01 | 9.85 | |
| GEW-7 | 12-13-94 | 01:00 PM | 1025.36 | 957.16 | 58.37 | 966.99 | 9.83 | |
| GEW-7 | 12-13-94 | 02:50 PM | 1025.36 | 957.16 | 58.33 | 967.03 | 9.87 | |
| GEW-7 | 12-13-94 | 02:55 PM | 1025.36 | 957.16 | 58.40 | 966.96 | 9.80 | |
| GEW-7 | 2-9-95 | 11:50 AM | 1025.36 | 957.16 | 57.25 | 968.11 | 10.95 | |
| GEW-8 | 12-13-94 | 11:45 AM | 1024.23 | 971.10 | 45.43 | 978.80 | 7.70 | clean |
| GEW-8 | 12-13-94 | 12:15 PM | 1024.23 | 971.10 | 45.35 | 978.88 | 7.78 | |
| GEW-9 | 12-13-94 | 11:50 AM | 1024.77 | 978.87 | 40.92 | 983.85 | 4.98 | muck |
| GEW-9 | 12-13-94 | 12:30 PM | 1024.77 | 978.87 | 40.93 | 983.84 | 4.97 | |
| GEW-9 | 12-13-94 | 12:35 PM | 1024.77 | 978.87 | 40.93 | 983.84 | 4.97 | |
| GEW-9 | 12-13-94 | 03:15 PM | 1024.77 | 978.87 | 40.90 | 983.87 | 5.00 | |
| GEW-9 | 2-9-95 | 12:00 PM | 1024.77 | 978.87 | 40.30 | 984.47 | 5.60 | |
| GEW-10 | 12-13-94 | 12:05 PM | 1031.26 | 961.13 | 65.23 | 966.03 | 4.90 | muck |
| GEW-10 | 12-13-94 | 12:40 PM | 1031.26 | 961.13 | 65.25 | 966.01 | 4.88 | |
| GEW-10 | 12-13-94 | 12:45 PM | 1031.26 | 961.13 | 65.22 | 966.04 | 4.91 | |
| GEW-10 | 12-13-94 | 02:45 PM | 1031.26 | 961.13 | 65.18 | 966.08 | 4.95 | |
| GEW-10 | 12-13-94 | 02:47 PM | 1031.26 | 961.13 | 65.20 | 966.06 | 4.93 | wetted tape |
| GEW-10 | 2-9-95 | 11:55 AM | 1031.26 | 961.13 | 64.05 | 967.21 | 6.08 | wetted tape |
| GEW-11 | 12-14-94 | 09:05 AM | 1032.60 | 961.45 | 69.09 | 963.51 | 2.06 | |
| GEW-11 | 2-9-95 | 11:45 AM | 1032.60 | 961.45 | 69.10 | 963.50 | 2.05 | |
| GEW-12 | 12-13-94 | 03:20 PM | 1025.72 | 955.92 | 68.91 | 956.81 | 0.89 | |
| GEW-13 | 12-13-94 | 03:30 PM | 1022.81 | 977.56 | 44.25 | 978.56 | 1.00 | |
| GEW-14 | 12-14-94 | 08:40 AM | 1031.48 | 964.18 | 67.15 | 964.33 | 0.15 | |
| GEW-14 | 2-9-95 | 11:40 AM | 1031.48 | 964.18 | -- | -- | 0 | dry |
| GEW-15 | 12-13-94 | 03:40 PM | 1021.65 | 1000.10 | 21.35 | 1000.30 | 0.20 | |
| GEW-16 | 12-14-94 | 09:00 AM | 1012.84 | 993.44 | 19.23 | 993.61 | 0.17 | |
| GEW-16 | 2-9-95 | 11:30 AM | 1012.84 | 993.44 | 19.25 | 993.59 | 0.15 | |
| GEW-17 | 12-13-94 | 04:00 PM | 1026.70 | 982.80 | -- | -- | 0 | dry |
| GEW-17 | 2-9-95 | 11:35 AM | 1026.70 | 982.80 | 43.60 | 983.10 | 0.30 | |
| GEW-18 | 12-13-94 | 04:08 PM | 1027.73 | 987.32 | 40.14 | 987.59 | 0.27 | |

Note: Measurements were taken with an MMC probe unless otherwise noted.

- 1 Reference elevations are for top of PVC casing for the leachate head wells and top of 6" tee lip for the gas extraction wells. All elevations were surveyed on the north side of wells and was performed 1/13 and 1/19/95.
- 2 Depth to leachate is from the top of the 6" tee of each gas extraction well.
- 3 Leachate elevations are relative and not exact for the gas extraction wells. The difference between the top of the 6" tee and the top of the 6" tee lip is approximately 1.5 inches.

Wenck Associates, Inc.

PNEUMOMETERS

Other

Facility Name: Junker Landfill Facility ID Number: 1972 Date: Dec. 5, 1989 Completed By (Name and Firm): Kirk Thornton, Central Wisconsin Eng'g. *AUG 17 1990*

| Well Name | Well ID Number (DNR No.) | Well Location | N | S | E | W | Date Established | Well Casing | | Elevations | | | Reference | | Screen | | Type of Well (✓) | | | | | | | | |
|------------|--------------------------|---------------|---|---|---|---|------------------|-------------|------|--------------------|----------------|------------|-----------|----------------|--------|----------|------------------|------|----|----|-----|-------|--|--|--|
| | | | | | | | | Diam. | Type | Top of Well Casing | Ground Surface | Screen Top | MSL (✓) | Site Datum (✓) | Length | Material | Well Depth | PIEZ | OW | PW | LVS | Other | | | |
| EH109 | | 208 | x | | | | | | Cast | | | | | | | | | | | | | | | | |
| MW-3 | 3 | 2390 | | | | x | 1974 | 4" | Iron | NA | 985.35 | NA | X | | NA | NA | 105.0 | | X | | | | | | |
| EH110 | | 43 | x | | | | | | | | | | | | | | | | | | | | | | |
| MW-4 | 4 | 1295 | | | | x | 7/4/85 | 2" | PVC | 1014.43 | 1012.5 | 900.43 | X | | 15 ft. | PVC | 129.0 | | X | | | | | | |
| EH111 | | 79 | x | | | | | | | | | | | | | | | | | | | | | | |
| MW-5 | 5 | 1805 | | | | x | 7/5/85 | 2" | PVC | 1002.59 | 1000.90 | 900.9 | X | | 15 ft. | PVC | 116.69 | | | | | | | | |
| EH112 | | 30 | x | | | | | | | | | | | | | | | | | | | | | | |
| MW-7 | 7 | 518 | | | | x | 10/19/89 | 2" | PVC | 1012.99 | 1010.7 | 902.3 | X | | 15 ft. | PVC | 125.8 | | X | | | | | | |
| EH113 | | 861 | x | | | | | | | | | | | | | | | | | | | | | | |
| MW-8 | 8 | 1189 | | | | x | 10/9/89 | 2" | PVC | 1002.44 | 1001.2 | 901.2 | X | | 15 ft. | PVC | 117.3 | | X | | | | | | |
| EH114 | | 389 | x | | | | | | | | | | | | | | | | | | | | | | |
| MW-9 | 9 | 1653 | | | | x | 10/3/89 | 2" | PVC | 1006.53 | 1004.9 | 899.4 | X | | 15 ft. | PVC | 122.5 | | X | | | | | | |
| EH115 | | 392 | x | | | | | | | | | | | | | | | | | | | | | | |
| MW-10 | 10 | 1659 | | | | x | 9/28/89 | 2" | PVC | 1006.16 | 1004.9 | 869.6 | X | | 5 ft. | PVC | 142.4 | | X | | | | | | |
| EH116 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Trap Blank | 11 | | | | | | | | | | | | | | | | | | | | | | | | |

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Table 2-9: RI Groundwater Monitoring Network Construction Summary
Junker Landfill - Hudson Township, Wisconsin

| Well | Date Installed | Top of Inner Casing (ft msl) | Grade (ft msl) | Bottom of Sand Pack (ft bgl) | Well Diam. (in) | Well Const. Material | Sampling Equipment | Gravel Pack Length (ft) | Gravel Pack Top (ft msl) | Gravel Pack Bottom (ft msl) | Formation Packed In : | | |
|--------------|----------------|---------------------------------|-------------------|---------------------------------|--------------------|----------------------|--------------------|----------------------------|-----------------------------|--------------------------------|-----------------------|--------------------------|----------------|
| | | | | | | | | | | | Glacial (ft) | Prairie du Chien (ft) | Jordan (ft) |
| MW-3 | 1-1-74 | 986.92 | 985.30 | 105 | 4 | | WaTerra Sys. | 10 | 890.30 | 880.30 | | | |
| MW-4 | 04-Jul-85 | 1017.64 | 1016.30 | 127 | 2 | PVC | WaTerra Sys. | 20 | 909.30 | 889.30 | | | 10 |
| MW-5 | 05-Jul-85 | 1002.62 | 1001.40 | 115 | 2 | PVC | WaTerra Sys. | 18 | 904.40 | 886.40 | | | 20 |
| MW-6 | 28-Jun-85 | 1009.66 | 1007.80 | 114.5 | 2 | PVC | WaTerra Sys. | 18 | 911.30 | 893.30 | | | 18 |
| MW-7 | 19-Oct-89 | 1013.01 | 1010.80 | 123.4 | 2 | PVC | WaTerra Sys. | 18.5 | 905.90 | 887.40 | | | 18 |
| MW-8 | 09-Oct-89 | 1003.34 | 1002.30 | 115 | 2 | PVC | WaTerra Sys. | 18 | 905.30 | 887.30 | | | 18.5 |
| MW-9 | 03-Oct-89 | 1006.57 | 1005.40 | 120.5 | 2 | PVC | WaTerra Sys. | 19.4 | 904.30 | 884.90 | | | 18 |
| MW-10 | 28-Sep-89 | 1006.18 | 1005.90 | 140.7 | 2 | PVC | WaTerra Sys. | 9.1 | 874.30 | 865.20 | | | 19.4 |
| NLMW-11 | 17-Aug-92 | 867.95 | 864.90 | 35 | 2 | PVC | Bailer | 22.5 | 852.40 | 829.90 | 22.5 | | 9.1 |
| NLMW-12 | 17-Aug-92 | 871.85 | 868.80 | 37.5 | 2 | PVC | Bailer | 20.5 | 851.80 | 831.30 | 20.5 | | |
| NLMW-13 | 18-Aug-92 | 899.30 | 896.60 | 60 | 2 | PVC | Pump & Bailer | 20 | 856.60 | 836.60 | 20 | | |
| MW-50S | 06-Aug-91 | 918.80 | 916.60 | 67 | 2 | PVC | Pump & Bailer | 23 | 872.60 | 849.60 | | | 21 |
| MW-50D | 09-Aug-91 | 918.65 | 916.70 | 123 | 2 | PVC | Pump & Bailer | 13.2 | 806.90 | 793.70 | | | 11 |
| #928 Cty. A | 08-Dec-56 | | 915.5 | 141 | 6 | Steel (open) | Domestic Pump | 94 | 868.50 | 774.50 | | | 94 |
| #965 Cty. A | 01-May-65 | | 926.8 | 123 | 6 | Steel (open) | Domestic Pump | 70 | 873.80 | 803.80 | | | 70 |
| #981 Cty. A | 05-Dec-58 | | 926.6 | 137 | 6 | Steel (open) | Domestic Pump | 97 | 886.60 | 789.60 | | | 97 |
| G.S. Camp | 12-May-69 | | 936.8 | 204 | 10 | Steel (open) | Domestic Pump | 54 | 786.80 | 732.80 | | | 54 |
| #890 Hwy.12 | 05-Jul-72 | | 1042.5 | 185 | 6 | Steel (open) | Domestic Pump | 40 | 897.50 | 857.50 | | | 40 |
| #923 LaBarge | 14-May-73 | | 937* | 115 | 6 | Steel (open) | Domestic Pump | 31 | 853.00* | 796.00* | | | 31 |
| #932 LaBarge | 13-May-92 | | 935.1 | 141 | 6 | Steel | Domestic Pump | 7 | 801.10 | 794.10 | 7 | | |
| #982 Tanney | | | 901.4 | | 6 | | Domestic Pump | | | | | | |
| #994 Tanney | 1985 | | 896.4 | | | | Domestic Pump | | | | | | |
| WW-11 | 08-Feb-95 | 1034.16 | 1032.2 | 155 | 2 | PVC | WaTerra Sys. | 22.5 | 899.70 | 877.20 | | | 22.5 |
| WW-12 | 20-Jan-95 | 1065.54 | 1063.5 | 175 | 2 | PVC | WaTerra Sys. | 22.5 | 911.00 | 888.50 | | | 22.5 |
| WW-13 | 13-Jan-95 | 1011.85 | 1010.3 | 125 | 2 | PVC | WaTerra Sys. | 22.5 | 907.80 | 885.30 | | | 22.5 |
| WW-14 | 30-Jan-95 | 970.75 | 968.8 | 92 | 2 | PVC | WaTerra Sys. | 22.5 | 899.30 | 876.80 | | | 22.5 |
| WW-15A | 11-Jan-95 | 924.29 | 922.3 | 76 | 2 | PVC | WaTerra Sys. | 22.5 | 868.80 | 846.30 | 4.5 | | 18.0 |
| WW-15B | 19-Jan-95 | 924.52 | 922.6 | 151 | 2 | PVC | WaTerra Sys. | 22.5 | 794.10 | 771.60 | | | 22.5 |
| WW-15C | 02-Feb-95 | 924.26 | 922.2 | 200 | 2 | PVC | WaTerra Sys. | 22.5 | 744.70 | 722.20 | | | 22.5 |
| WW-16 | 02-Mar-95 | 915.13 | 913.2 | 70 | 2 | PVC | WaTerra Sys. | 22.5 | 865.70 | 843.20 | 22.5 | | |

* Elevation is approximate.

Table 2-4a: Leachate and Groundwater Sampling Program (Round 1)

Junker Landfill - Hudson Township, Wisconsin

| MONITORING WELL SAMPLING LOCATIONS | DATE SAMPLED | VOC 8260 | VOC 524.2 | SVOC 8270 | PCB/PEST 8081 | DISSOLVED METALS | TOTAL METALS | DUPLICATE SAMPLE | RINSE BLANK | FIELD BLANK | MATRIX SPIKE | MATRIX SPIKE DUPLICATE |
|---------------------------------------|-----------------|-------------|--------------|--------------|------------------|---------------------|-----------------|---------------------|----------------|----------------|-----------------|---------------------------|
| WW-11 | 2-21-95 | X | | X | X | X | X | | | | | |
| WW-12 | 1-31-95 | X | | | | | | MW-201 | | MW-101 | | |
| WW-16 | 3-8-95 | XXX | | | | | | MW-205 | | MW-113 | X | X |
| WW-15A | 2-7-95 | XXX | | X | X | X | | | MW-302 | | | |
| WW-15B | 2-7-95 | XXX | | | | | | | | MW-105 | | |
| WW-15C | 2-7-95 | XXX | | | | | | | | | | |
| WDNR-MW-50S | 2-1-95 | X | | | | | | | | | | |
| WDNR-MW-50D | 2-2-95 | X | | | | | | | MW-301 | MW-103 | | |
| NL MW-11 | 2-6-95 | X | | | | | | | | | | |
| NL MW-12 | 2-2-95 | X | | | | | | | | | | |
| NL MW-13 | 2-6-95 | X | | | | | | | | MW-104 | | |
| WW-14 | 2-9-95 | X | | | | | | | | | | |
| WW-13 | 2-9-95 | X | | X | X | X | X | MW-202 | MW-303 | MW-107 | | |
| MW-10 | 1-31-95 | X | | | | | | | | | | |
| MW-6 | 1-31-95 | X | | | | | | | | | | |
| MW-4 | 2-1-95 | X | | | | | | | | | | |
| MW-8 | 1-31-95 | X | | | | | | | | | | |
| MW-9 | 2-13-95 | X | | X | X | X | | | | | X | X |
| MW-7 | 2-1-95 | X | | | | | | | | MW-102 | | |
| MW-5 | 2-8-95 | X | | X | X | X | | | | MW-106 | | |
| MW-3 | 2-8-95 | X | | X | X | X | X | | | | | |

TOTAL TRIP BLANKS

9

RESIDENTIAL WELL
SAMPLING LOCATIONS

| | | | | | | | | | | | | |
|---------------------|---------|--|---|--|--|--|---|------------------|--|--|---|---|
| 928 CO ROAD A | 2-6-95 | | X | | | | | 669 CO RD A | | | | |
| 965 CO ROAD A | 2-6-95 | | X | | | | | | | | | |
| 980 CO ROAD A | 2-6-95 | | X | | | | X | | | | | |
| 981 CO ROAD A | 2-6-95 | | X | | | | | | | | | |
| G.S. TROOPHOUSE | 2-6-95 | | X | | | | | | | | | |
| 890 E. HIGHWAY 12 | 2-5-95 | | X | | | | | | | | X | X |
| 923 LABARGE RD | 2-6-95 | | X | | | | | | | | | |
| 932 LABARGE RD | 2-6-95 | | X | | | | | | | | | |
| 963 LABARGE RD | 2-6-95 | | X | | | | X | | | | | |
| 982 TANNEY LANE | 2-6-95 | | X | | | | | | | | | |
| 994 TANNEY LANE | 2-6-95 | | X | | | | | | | | | |
| 786 MC CUTCHEON | 2-16-95 | | X | | | | X | 1313 MC CUTCHEON | | | | |
| ST. CROIX CO GARAGE | NS-R1 | | | | | | | | | | | |
| 720 NORFLEX DR. | NS-R1 | | | | | | | | | | | |

TOTAL TRIP BLANKS

2

QA / QC
SAMPLING LOCATIONS

DUPLICATES

| | | | | | | | | | | | | |
|------------------|---------|---|---|---|---|---|---|--|--|--|--|---|
| MW-201 | 1-31-95 | X | | | | | | | | | | |
| MW-202 | 2-9-95 | X | | X | X | X | X | | | | | |
| MW-205 | 3-8-95 | X | | | | | | | | | | |
| 669 CO RD A | 2-6-95 | | X | | | | | | | | | |
| 1313 MC CUTCHEON | 2-16-95 | | X | | | | | | | | | X |

RINSE BLANKS

| | | | | | | | | | | | | |
|--------|--------|---|--|--|--|---|--|--|--|--|--|--|
| MW-301 | 2-2-95 | X | | | | | | | | | | |
| MW-302 | 2-7-95 | | | | | X | | | | | | |
| MW-303 | 2-9-95 | | | | | X | | | | | | |

FIELD BLANKS

| | | | | | | | | | | | | |
|--------|---------|---|--|--|--|--|--|--|--|--|--|--|
| MW-101 | 1-31-95 | X | | | | | | | | | | |
| MW-102 | 2-1-95 | X | | | | | | | | | | |
| MW-103 | 2-2-95 | X | | | | | | | | | | |
| MW-104 | 2-6-95 | X | | | | | | | | | | |
| MW-105 | 2-7-95 | X | | | | | | | | | | |
| MW-106 | 2-8-95 | X | | | | | | | | | | |
| MW-107 | 2-9-95 | X | | | | | | | | | | |
| MW-113 | 3-8-95 | X | | | | | | | | | | |

MS / MSD

| | | | | | | | | | | | | |
|-----------------------|---------|---|---|---|---|---|--|--|--|--|--|--|
| MW-9MS | 2-13-95 | X | | X | X | X | | | | | | |
| MW-9MSD | 2-13-95 | X | | X | X | X | | | | | | |
| WW-16MS | 3-8-95 | X | | | | | | | | | | |
| WW-16MSD | 3-8-95 | X | | | | | | | | | | |
| 890 E. HIGHWAY 12 MS | 2-5-95 | | X | | | | | | | | | |
| 890 E. HIGHWAY 12 MSD | 2-5-95 | | X | | | | | | | | | |

LEACHATE SAMPLES

| | | | | | | | | | | | | |
|--------|--------|---|--|---|---|--|---|--|--|--|--|--|
| GEW-7 | 2-9-95 | X | | X | X | | X | | | | | |
| GEW-8 | 2-9-95 | X | | X | X | | X | | | | | |
| GEW-9 | 2-9-95 | X | | X | X | | X | | | | | |
| GEW-10 | 2-9-95 | X | | X | X | | X | | | | | |
| LHW-1 | 2-9-95 | X | | X | X | | X | | | | | |

NOTES:

NL = Nor Lake Monitoring Well

XXX = QUICK TURN-A-ROUND FOR VOC ANALYSIS

NS-R1 = NOT SAMPLED DURING ROUND 1

ALTHOUGH COLLECTED ON 2-7-95, WW-15A (DISSOLVED METALS) AND MW-302 (RINSE BLANK, DISSOLVED METALS), WERE SHIPPED TO H.E.S. ON 2-8-95.

Table 2-4b: Groundwater Sampling Program (Round 2)
Junker Landfill - Hudson Township, Wisconsin

| MONITORING WELL SAMPLING LOCATIONS | DATE SAMPLED | VOC 8260 | VOC 524.2 | SVOC 8270 | PCB/PEST 8081 | DISSOLVED METALS | TOTAL METALS | DUPLICATE SAMPLE | RINSE BLANK | FIELD BLANK | MATRIX SPIKE | MATRIX SPIKE DUPLICATE |
|---------------------------------------|-----------------|-------------|--------------|--------------|------------------|---------------------|-----------------|---------------------|----------------|----------------|-----------------|---------------------------|
| WW-11 | 03/09/95 | X | | X | X | X | X | | | MW-114 | | |
| WW-12 | 02/28/95 | X | | | | | | MW-203 | | MW-108 | | |
| WW-16 | 03/15/95 | X | | | | | | | | MW-115 | X | X |
| WW-15A | 03/07/95 | XXX | | X | X | X | | | MW-304 | MW-112 | | |
| WW-15B | 03/07/95 | XXX | | | | | | | | | | |
| WW-15C | 03/07/95 | XXX | | | | | | | | | | |
| WDNR-MW-50S | 03/01/95 | X | | | | | | | | | | |
| WDNR-MW-50D | 03/01/95 | X | | | | | | | MW-303/2 | MW-109 | | |
| NL MW-11 | 03/02/95 | X | | | | | | | | | | |
| NL MW-12 | 03/02/95 | X | | | | | | | | MW-110 | | |
| NL MW-13 | 03/02/95 | X | | | | | | | | | | |
| WW-14 | 03/07/95 | X | | | | | | | | | | |
| WW-13 | 03/09/95 | X | | X | X | X | X | MW-204 | | | | |
| MW-10 | 02/28/95 | X | | | | | | | | | | |
| MW-6 | 02/28/95 | X | | | | | | | | | | |
| MW-4 | 02/28/95 | X | | | | | | | | | | |
| MW-8 | 02/28/95 | X | | | | | | | | | X | X |
| MW-9 | 03/09/95 | X | | X | X | X | | | | | | |
| MW-7 | 02/28/95 | X | | | | | | | | | | |
| MW-5 | 03/09/95 | X | | X | X | X | | | | | | |
| MW-3 | 03/08/95 | X | | X | X | X | X | | | MW-111 | | |

TOTAL TRIP BLANKS

6

**RESIDENTIAL WELL
SAMPLING LOCATIONS**

| | | | | | | | | | | | | |
|---------------------|----------|--|---|--|--|--|---|----------------------|--|--|---|---|
| 928 CO ROAD A | 03/01/95 | | X | | | | | 669 CO RD A - 2 | | | | |
| 965 CO ROAD A | 03/02/95 | | X | | | | | | | | | |
| 980 CO ROAD A | 03/06/95 | | X | | | | X | | | | | |
| 981 CO ROAD A | 03/02/95 | | X | | | | | | | | | |
| G.S. TROOPHOUSE | 03/01/95 | | X | | | | | | | | X | X |
| 890 E. HIGHWAY 12 | 03/02/95 | | X | | | | | | | | | |
| 923 LABARGE RD | 03/01/95 | | X | | | | | | | | | |
| 932 LABARGE RD | 03/01/95 | | X | | | | | | | | | |
| 963 LABARGE RD | 03/02/95 | | X | | | | X | | | | | |
| 982 TANNEY LANE | 03/02/95 | | X | | | | | | | | | |
| 994 TANNEY LANE | 03/02/95 | | X | | | | | | | | | |
| 786 MC CUTCHEON | 03/01/95 | | X | | | | | 1313 MC CUTCHEON - 2 | | | | |
| ST. CROIX CO GARAGE | 03/02/95 | | X | | | | | | | | | |
| 720 NORFLEX DR | 03/02/95 | | X | | | | | | | | | |

TOTAL TRIP BLANKS

3

**QA / QC
SAMPLING LOCATIONS**

DUPLICATES

| | | | | | | | | | | | | |
|----------------------|----------|---|---|---|---|---|---|--|--|--|--|--|
| MW-203 | 02/28/95 | X | | | | | | | | | | |
| MW-204 | 03/09/95 | X | | X | X | X | X | | | | | |
| 669 CO RD A - 2 | 03/01/95 | | X | | | | | | | | | |
| 1313 MC CUTCHEON - 2 | 03/01/95 | | X | | | | | | | | | |

RINSE BLANKS

| | | | | | | | | | | | | |
|----------|----------|---|--|--|--|--|---|--|--|--|--|--|
| MW-303/2 | 03/01/95 | X | | | | | | | | | | |
| MW-304 | 03/07/95 | | | | | | X | | | | | |

FIELD BLANKS

| | | | | | | | | | | | | |
|--------|----------|---|--|--|--|--|--|--|--|--|--|--|
| MW-108 | 02/28/95 | X | | | | | | | | | | |
| MW-109 | 03/01/95 | X | | | | | | | | | | |
| MW-110 | 03/02/95 | X | | | | | | | | | | |
| MW-111 | 03/06/95 | X | | | | | | | | | | |
| MW-112 | 03/07/95 | X | | | | | | | | | | |
| MW-114 | 03/09/95 | X | | | | | | | | | | |
| MW-115 | 03/15/95 | X | | | | | | | | | | |

MS / MSD

| | | | | | | | | | | | | |
|-----------------------|----------|---|---|---|---|---|--|--|--|--|--|--|
| MW-9 MS | 03/09/95 | X | | X | X | X | | | | | | |
| MW-9 MSD | 03/09/95 | X | | X | X | X | | | | | | |
| 890 E. HIGHWAY 12 MS | 03/02/95 | | X | | | | | | | | | |
| 890 E. HIGHWAY 12 MSD | 03/02/95 | | X | | | | | | | | | |
| WW-16 MS | 03/15/95 | X | | | | | | | | | | |
| WW-16 MSD | 03/15/95 | X | | | | | | | | | | |

NOTES:

"NL" - Not Lake Monitoring Well
XXX - QUICK TURN-A-ROUND FOR VOC ANALYSIS
TRIP BLANK NOT INDICATED ON CHAIN OF CUSTODY #2233 FOR SAMPLING AT MW-3 ON 3-6-95
WW-16 MS AND WW-16 MSD ANALYZED, BUT WERE NOT ON CHAIN OF CUSTODY

**Table 2-5: Primary Compounds in Groundwater and Leachate
Junker Landfill - Hudson Township, Wisconsin**

| Well | Date | WDNR ES | Trichloro ethene | Tetrachloro ethene | Freon-12 | Freon-11 |
|---------------------------|-----------|---------------------|---------------------|-----------------------|---------------------|---------------------|
| | | WDNR PAL Maximum | 5 0.5 54.0 | 5 0.5 17.0 | 1000 200 19.0 | 3490 698 35.0 |
| St. Croix Co Garage | 02-Mar-95 | | <0.2 | <0.2 | <0.2 | <0.3 |
| St. Croix Co Garage | 21-Jun-95 | | <0.2 | <0.2 | <0.2 | <0.3 |
| Troop House G.S. Camp | 23-Apr-84 | | 3.7 | 8.2 | ND | 10.0 |
| Troop House G.S. Camp | 07-Feb-85 | | 3.0 | 7.4 | 3.2 | 8.4 |
| Troop House G.S. Camp | 11-Feb-85 | | 4.6 | 12.0 | NA | 19.0 |
| Troop House G.S. Camp | 07-Oct-85 | | 3.1 | 5.9 | NA | 15.0 |
| Troop House G.S. Camp | 06-Aug-87 | | 1.6 | 1.7 | 5.7 | 5.0 |
| Troop House G.S. Camp | 13-Aug-87 | | 1.6 | 1.7 | 5.7 | 5.0 |
| Troop House G.S. Camp | 19-Sep-88 | | 2.2 | 1.6 | 2.3 | 3.9 |
| Troop House G.S. Camp | 24-Aug-89 | | 3.7 | 1.3 | ND | 12.0 |
| Troop House G.S. Camp | 01-Jan-90 | | 5.0 | 1.2 | NA | 13.0 |
| Troop House G.S. Camp | 10-Oct-90 | | 3.3 | 1.6 | ND | 3.0 |
| Troop House G.S. Camp | 18-May-92 | | 3.1 | 1.7 | NA | 5.3 |
| Troop House G.S. Camp | 16-Sep-93 | | 1.0 | ND | ND | 1.3 |
| Troop House G.S. Camp | 05-Apr-94 | | 0.6 | BEQL | 0.6 | 0.6 |
| Troop House G.S. Camp dup | 05-Apr-94 | | 0.6 | 0.7 | NA | ND |
| Troop House G.S. Camp | 04-Aug-94 | | BEQL<1 | BEQL<1 | BEQL<2** | BEQL<1 |
| Troop House G.S. Camp dup | 04-Aug-94 | | BEQL<1 | BEQL<1 | BEQL<1 | BEQL<1 |
| Troop House G.S. Camp | 06-Feb-95 | | J 1 | J 0.7 | J 1 | J 1 |
| Troop House G.S. Camp | 01-Mar-95 | | J 0.3 | J 0.3 | J 3 | J 0.4 |
| 720 Norflex Dr | 02-Mar-95 | | 0.8 | <0.2 | <0.2 | <0.3 |
| 720 Norflex Dr | 21-Jun-95 | | 1 | <0.2 | <0.2 | <0.3 |
| 786 McCutcheon Rd. | 16-Feb-95 | | 2 | 0.4 | 1 | 0.9 |
| 786 McCutcheon Rd. dup | 16-Feb-95 | | 2 | 0.4 | <0.2 | 0.8 |
| 786 McCutcheon Rd. | 01-Mar-95 | | 1 | 0.2 | J 2 | 0.4 |
| 786 McCutcheon Rd. dup | 01-Mar-95 | | J 0.5 | <0.2 | J 2 | <0.3 |
| 890 E. Hwy. 12 | 16-Jan-84 | | 21.0 | ND | NA | ND |
| 890 E. Hwy. 12 | 09-Apr-84 | | ND | ND | NA | ND |
| 890 E. Hwy. 12 | 26-Nov-84 | | 18.0 | 17.0 | NA | 26.0 |
| 890 E. Hwy. 12 | 04-Feb-85 | | ND | ND | NA | 12.0 |
| 890 E. Hwy. 12 | 21-Oct-85 | | 32.0 | 8.9 | NA | 14.0 |
| 890 E. Hwy. 12 | 18-May-92 | | 26.0 | 2.2 | NA | 3.7 |
| 890 E. Hwy. 12 | 09-Nov-92 | | 26.0 | ND | NA | 1.6 |
| 890 E. Hwy. 12 | 14-Feb-94 | | 20.0 | ND | ND | 1.2 |
| 890 E. Hwy. 12 | 11-Aug-94 | | 29.0 | <0.2 | <0.2** | <0.2 |
| 890 E. Hwy. 12 dup | 11-Aug-94 | | 22.0 | <0.2 | <0.2 | BEQL<1 |
| 890 E. Hwy. 12 | 05-Feb-95 | | E 25 | <0.2 | J 0.3 | J 0.8 |
| 890 E. Hwy. 12 | 02-Mar-95 | | E 25 | <0.2 | J 3 | J 0.9 |
| 923 La Barge Rd. | 04-Sep-84 | | ND | ND | NA | ND |
| 923 La Barge Rd. | 18-Feb-85 | | ND | ND | NA | ND |
| 923 La Barge Rd. | 01-Mar-89 | | ND | 0.4 | NA | ND |
| 923 La Barge Rd. | 19-May-92 | | ND | ND | NA | ND |
| 923 La Barge Rd. | 09-Nov-92 | | ND | ND | NA | ND |
| 923 La Barge Rd. | 03-May-93 | | ND | ND | NA | ND |
| 923 La Barge Rd. | 03-Aug-94 | | <0.2 | <0.2 | <0.2** | <0.2 |
| 923 La Barge Rd. | 06-Feb-95 | | <0.2 | <0.2 | <0.2 | <0.3 |
| 923 La Barge Rd. | 01-Mar-95 | | <0.2 | <0.2 | <0.2 | <0.3 |
| 923 La Barge Rd. | 21-Jun-95 | | <0.2 | <0.2 | <0.2 | <0.3 |
| 928 Cty. Rd. A | 21-Oct-85 | | ND | ND | NA | ND |
| 928 Cty. Rd. A | 04-Aug-94 | | BEQL<1 | <0.2 | <0.2** | <0.2 |
| 928 Cty. Rd. A | 06-Feb-95 | | J 0.5 | <0.2 | J 0.6 | J 2 |
| 928 Cty. Rd. A | 01-Mar-95 | | 0.4 | <0.2 | 6 | 1 |
| 928 Cty. Rd. A dup | 06-Feb-95 | | J 0.7 | <0.2 | J 1 | J 2 |
| 928 Cty. Rd. A dup | 01-Mar-95 | | 0.4 | <0.2 | 5 | 1 |
| 932 La Barge Rd. | 29-Aug-94 | | 9.6 | 0.7 | <0.2** | BEQL<1 |

**Table 2-5: Primary Compounds in Groundwater and Leachate
Junker Landfill - Hudson Township, Wisconsin**

| Well | Date | WDNR ES | Trichloro ethene | Tetrachloro ethene | Freon-12 | Freon-11 |
|----------------------|-----------|----------|---------------------|-----------------------|----------|----------|
| | | WDNR PAL | 5 | 5 | 1000 | 3490 |
| | | Maximum | 0.5 | 0.5 | 200 | 698 |
| | | | 54.0 | 17.0 | 19.0 | 35.0 |
| 932 La Barge Rd. dup | 29-Aug-94 | | 8.2 | BEQL | BEQL<1 | 1.5 |
| 932 La Barge Rd. | 06-Feb-95 | | J 13 | J 1 | J 0.9 | J 3 |
| 932 La Barge Rd. | 01-Mar-95 | | 10 | 1 | 9 | 2 |
| 963 La Barge Rd. | 06-Feb-95 | | J 4 | J 1 | J 1 | J 3 |
| 963 La Barge Rd. | 02-Mar-95 | | J 0.9 | J 0.3 | J 3 | J 0.8 |
| 965 Cty. Rd. A | 09-Apr-84 | | ND | ND | NA | ND |
| 965 Cty. Rd. A | 21-Jan-86 | | ND | ND | NA | ND |
| 965 Cty. Rd. A | 21-Sep-87 | | ND | ND | NA | ND |
| 965 Cty. Rd. A | 27-Apr-92 | | ND | ND | NA | ND |
| 965 Cty. Rd. A | 11-Aug-94 | | <0.2 | <0.2 | <0.2** | <0.2 |
| 965 Cty. Rd. A | 06-Feb-95 | | <0.2 | <0.2 | <0.2 | <0.3 |
| 965 Cty. Rd. A | 02-Mar-95 | | <0.2 | <0.2 | <0.2 | <0.3 |
| 980 Cty. Rd. A | 06-Feb-95 | | J 0.6 | <0.2 | <0.2 | <0.3 |
| 980 Cty. Rd. A | 06-Mar-95 | | <0.2 | <0.2 | <0.2 | <0.3 |
| 981 Cty. Rd. A | 05-Mar-85 | | ND | ND | NA | ND |
| 981 Cty. Rd. A | 20-Apr-92 | | ND | ND | NA | ND |
| 981 Cty. Rd. A | 06-Feb-95 | | <0.2 | <0.2 | <0.2 | <0.3 |
| 981 Cty. Rd. A | 02-Mar-95 | | <0.2 | <0.2 | <0.2 | <0.3 |
| 982 Tanney Lane | 07-Jan-85 | | 2.1 | 1.4 | NA | 3.6 |
| 982 Tanney Lane | 25-Feb-85 | | 1.4 | ND | NA | 4.0 |
| 982 Tanney Lane | 12-Aug-94 | | 4.4 | BEQL<1 | <0.2** | BEQL<1 |
| 982 Tanney Lane dup | 12-Aug-94 | | 3.8 | BEQL<1 | BEQL<1 | 1.2 |
| 982 Tanney Lane | 06-Feb-95 | | J 6 | J 0.6 | J 0.6 | J 2 |
| 982 Tanney Lane | 02-Mar-95 | | J 5 | J 0.6 | J 5 | J 2 |
| 994 Tanney Lane | 03-Dec-84 | | ND | ND | NA | ND |
| 994 Tanney Lane | 02-Jul-88 | | ND | ND | NA | ND |
| 994 Tanney Lane | 10-Mar-92 | | ND | ND | NA | ND |
| 994 Tanney Lane | 11-May-92 | | ND | ND | NA | ND |
| 994 Tanney Lane | 08-Aug-94 | | <0.2 | <0.2 | <0.2** | <0.2 |
| 994 Tanney Lane | 06-Feb-95 | | <0.2 | <0.2 | <0.2 | J 0.3 |
| 994 Tanney Lane | 02-Mar-95 | | <0.2 | <0.2 | J 2 | J 0.3 |
| MW-3 | 17-Jan-75 | | NA | NA | NA | NA |
| MW-3 | 17-Nov-75 | | NA | NA | NA | NA |
| MW-3 | 12-Jan-76 | | NA | NA | NA | NA |
| MW-3 | 23-Apr-76 | | NA | NA | NA | NA |
| MW-3 | 04-Aug-76 | | NA | NA | NA | NA |
| MW-3 | 05-Nov-85 | | 9.2 | 3.7 | NA | 10.0 |
| MW-3 | 21-Nov-89 | | 14.2 | 3.3 | 3.4 | 3.5 |
| MW-3 | 20-Dec-89 | | 13.4 | 2.8 | <2 | 5.8 |
| MW-3 | 31-Jan-90 | | 19.2 | 4.1 | 14.5 | 13.0 |
| MW-3 | 07-Mar-90 | | 18.7 | 4.3 | 3.3 | 8.8 |
| MW-3 | 17-Dec-90 | | 12.5 | 2.3 | 6.7 | NA |
| MW-3 | 11-Mar-91 | | <1 | <1 | NA | NA |
| MW-3 | 24-Sep-91 | | 14.0 | 1.4 | 4.1 | NA |
| MW-3 | 03-Mar-92 | | <1 | 3.0 | 8.2 | NA |
| MW-3 | 21-Sep-92 | | 17.0 | 2.3 | <1 | NA |
| MW-3 | 02-Mar-93 | | 12.0 | 1.8 | <1 | NA |
| MW-3 | 22-Jun-93 | | 13.6 | 1.8 | 1.2 | NA |
| MW-3 | 18-Jul-94 | | 10.0 | 2.1 | <5 | NA |
| MW-3 | 20-Oct-94 | | <5 | <5 | <5 | NA |
| MW-3 | 08-Feb-95 | | J 11 | <2.5 | J 10 | J 12 |
| MW-3 | 06-Mar-95 | | 12 | <2.5 | <1.7 | <0.8 |
| MW-4 | 05-Nov-85 | | 5.4 | 14.0 | NA | 16.0 |
| MW-4 | 25-Nov-85 | | 3.1 | 7.4 | NA | 6.9 |

**Table 2-5: Primary Compounds in Groundwater and Leachate
Junker Landfill - Hudson Township, Wisconsin**

| Well | Date | WDNR ES | Trichloro ethene | Tetrachloro ethene | Freon-12 | Freon-11 |
|------|-----------|----------|---------------------|-----------------------|----------|----------|
| | | WDNR PAL | 5 | 5 | 1000 | 3490 |
| | | Maximum | 0.5 | 0.5 | 200 | 698 |
| | | | 54.0 | 17.0 | 19.0 | 35.0 |
| MW-4 | 21-Nov-89 | | 15.9 | 3.4 | <2 | 2.8 |
| MW-4 | 20-Dec-89 | | 14.5 | 1.9 | <2 | 1.0 |
| MW-4 | 31-Jan-90 | | 20.4 | 4.0 | 7.0 | 5.6 |
| MW-4 | 07-Mar-90 | | 16.8 | 3.0 | <2 | 2.3 |
| MW-4 | 17-Dec-90 | | 8.3 | 4.8 | 3.4 | NA |
| MW-4 | 11-Mar-91 | | <1 | <1 | NA | NA |
| MW-4 | 24-Sep-91 | | <1 | 1.6 | <1 | NA |
| MW-4 | 03-Mar-92 | | <1 | 1.9 | <1 | NA |
| MW-4 | 21-Sep-92 | | 4.0 | 3.1 | <1 | NA |
| MW-4 | 02-Mar-93 | | <1 | 1.5 | <1 | NA |
| MW-4 | 22-Jun-93 | | 1.5 | 1.4 | <1 | NA |
| MW-4 | 18-Jul-94 | | <1 | <1 | <5 | NA |
| MW-4 | 20-Oct-94 | | <5 | <5 | <5 | NA |
| MW-4 | 01-Feb-95 | | J 0.6 | <2.5 | <1.7 | <0.8 |
| MW-4 | 28-Feb-95 | | J 0.7 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| MW-5 | 05-Nov-85 | | 17.0 | 2.0 | NA | 6.8 |
| MW-5 | 25-Nov-85 | | 13.1 | 1.0 | NA | 2.2 |
| MW-5 | 21-Nov-89 | | 34.6 | 1.5 | 2.1 | 3.1 |
| MW-5 | 20-Dec-89 | | 34.3 | 1.2 | <2 | 1.8 |
| MW-5 | 31-Jan-90 | | 42.2 | 2.2 | <2 | 6.6 |
| MW-5 | 07-Mar-90 | | 27.8 | <0.5 | <2 | <1 |
| MW-5 | 17-Dec-90 | | 35.0 | 1.4 | 4.0 | NA |
| MW-5 | 11-Mar-91 | | <1 | <1 | NA | NA |
| MW-5 | 24-Sep-91 | | 24.0 | <1 | <1 | NA |
| MW-5 | 03-Mar-92 | | <1 | 2.9 | <1 | NA |
| MW-5 | 21-Sep-92 | | 11.0 | <1 | <1 | NA |
| MW-5 | 02-Mar-93 | | 9.9 | <1 | <1 | NA |
| MW-5 | 22-Jun-93 | | 8.9 | <1 | <1 | NA |
| MW-5 | 18-Jul-94 | | 9.3 | <1 | <5 | NA |
| MW-5 | 20-Oct-94 | | 8.1 | <5 | <5 | NA |
| MW-5 | 08-Feb-95 | | J 7 | <2.5 | J 2 | J 5 |
| MW-5 | 09-Mar-95 | | 7 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| MW-6 | 05-Nov-85 | | 6.5 | 9.9 | NA | 18.0 |
| MW-6 | 21-Nov-89 | | 2.9 | 6.9 | 4.5 | 7.2 |
| MW-6 | 24-Sep-91 | | <1 | 1.2 | 19.0 | NA |
| MW-6 | 02-Mar-93 | | <1 | <1 | <1 | NA |
| MW-6 | 22-Jun-93 | | 1.6 | 1.4 | <1 | NA |
| MW-6 | 18-Jul-94 | | <1 | <1 | <5 | NA |
| MW-6 | 20-Oct-94 | | <5 | <5 | <5 | NA |
| MW-6 | 31-Jan-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| MW-6 | 28-Feb-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| MW-7 | 21-Nov-89 | | 16.7 | 0.5 | <2 | <1 |
| MW-7 | 20-Dec-89 | | 14.5 | 0.7 | <2 | <1 |
| MW-7 | 31-Jan-90 | | 20.9 | 1.5 | 2.1 | 1.7 |
| MW-7 | 07-Mar-90 | | 10.9 | <0.5 | <2 | <1 |
| MW-7 | 17-Dec-90 | | 16.2 | 3.8 | <2 | NA |
| MW-7 | 11-Mar-91 | | <1 | <1 | NA | NA |
| MW-7 | 24-Sep-91 | | 8.7 | <1 | <1 | NA |
| MW-7 | 03-Mar-92 | | <1 | <1 | 5.3 | NA |
| MW-7 | 21-Sep-92 | | 6.4 | <1 | <1 | NA |
| MW-7 | 02-Mar-93 | | 6.8 | <1 | <1 | NA |
| MW-7 | 22-Jun-93 | | 6.8 | <1 | <1 | NA |
| MW-7 | 18-Jul-94 | | 3.5 | 3.6 | <5 | NA |
| MW-7 | 20-Oct-94 | | <5 | <5 | <5 | NA |
| MW-7 | 01-Feb-95 | | J 4 | <2.5 | <1.7 | <0.8 |
| MW-7 | 28-Feb-95 | | 5 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| MW-8 | 21-Nov-89 | | 0.6 | 1.2 | <2 | 1.4 |
| MW-8 | 20-Dec-89 | | 0.4 | 0.7 | <2 | <1 |

**Table 2-5: Primary Compounds in Groundwater and Leachate
Junker Landfill - Hudson Township, Wisconsin**

| Well | Date | WDNR ES | Trichloro ethene | Tetrachloro ethene | Freon-12 | Freon-11 |
|---------|-----------|----------|---------------------|-----------------------|----------|----------|
| | | WDNR PAL | 5 | 5 | 1000 | 3490 |
| | | Maximum | 0.5 | 0.5 | 200 | 698 |
| | | | 54.0 | 17.0 | 19.0 | 35.0 |
| MW-8 | 31-Jan-90 | | 1.2 | 1.1 | 2.8 | 1.7 |
| MW-8 | 07-Mar-90 | | 0.9 | 0.8 | <2 | <1 |
| MW-8 | 17-Dec-90 | | 0.6 | 1.1 | 3.4 | NA |
| MW-8 | 11-Mar-91 | | <1 | <1 | NA | NA |
| MW-8 | 24-Sep-91 | | <1 | <1 | NA | NA |
| MW-8 | 03-Mar-92 | | <1 | <1 | 7.5 | NA |
| MW-8 | 21-Sep-92 | | 1.9 | 1.1 | <1 | NA |
| MW-8 | 02-Mar-93 | | <1 | <1 | <1 | NA |
| MW-8 | 22-Jun-93 | | <1 | <1 | <1 | NA |
| MW-8 | 18-Jul-94 | | <1 | 1.6 | <5 | NA |
| MW-8 | 20-Oct-94 | | <5 | <5 | <5 | NA |
| MW-8 | 31-Jan-95 | | <0.5 | <2.5 | J 2 | <0.8 |
| MW-8 | 28-Feb-95 | | J 0.9 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| MW-9 | 21-Nov-89 | | 5.4 | 6.4 | 7.6 | 10.5 |
| MW-9 | 20-Dec-89 | | 4.9 | 4.3 | <2 | 4.0 |
| MW-9 | 31-Jan-90 | | 9.6 | 5.7 | 13.7 | 10.1 |
| MW-9 | 07-Mar-90 | | 7.5 | 4.4 | <2 | 4.5 |
| MW-9 | 17-Dec-90 | | 7.7 | 2.3 | 2.2 | NA |
| MW-9 | 11-Mar-91 | | <1 | <1 | NA | NA |
| MW-9 | 24-Sep-91 | | 8.9 | <1 | NA | NA |
| MW-9 | 03-Mar-92 | | <1 | 1.4 | <1 | NA |
| MW-9 | 21-Sep-92 | | 1.5 | 1.0 | <1 | NA |
| MW-9 | 02-Mar-93 | | 5.5 | <1 | <1 | NA |
| MW-9 | 22-Jun-93 | | 3.5 | <1 | <1 | NA |
| MW-9 | 18-Jul-94 | | 4.0 | <1 | <5 | NA |
| MW-9 | 20-Oct-94 | | <5 | <5 | <5 | NA |
| MW-9 | 13-Feb-95 | | J 4 | <2.5 | <1.7 | <0.8 |
| MW-9 | 09-Mar-95 | | J 3 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| MW-10 | 21-Nov-89 | | 0.6 | 0.9 | <2 | 1.8 |
| MW-10 | 20-Dec-89 | | 0.5 | 0.8 | <2 | 1.2 |
| MW-10 | 31-Jan-90 | | 1.6 | 1.9 | 4.0 | 4.5 |
| MW-10 | 07-Mar-90 | | 0.9 | 1.4 | <2 | 1.8 |
| MW-10 | 17-Dec-90 | | 0.8 | 0.9 | <2 | NA |
| MW-10 | 11-Mar-91 | | <1 | <1 | NA | NA |
| MW-10 | 24-Sep-91 | | <1 | <1 | NA | NA |
| MW-10 | 03-Mar-92 | | <1 | 1.5 | 1.4 | NA |
| MW-10 | 21-Sep-92 | | 1.5 | 1.0 | <1 | NA |
| MW-10 | 02-Mar-93 | | <1 | 1.3 | <1 | NA |
| MW-10 | 22-Jun-93 | | 1.5 | 1.3 | <1 | NA |
| MW-10 | 18-Jul-94 | | <1 | <1 | <5 | NA |
| MW-10 | 20-Oct-94 | | <5 | <5 | <5 | NA |
| MW-10 | 31-Jan-95 | | J 1 | <2.5 | J 4 | <0.8 |
| MW-10 | 28-Feb-95 | | J 1 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| NLMW-11 | 28-Aug-92 | | 0.8 | ND | ND | ND |
| NLMW-11 | 22-Sep-92 | | 0.6 | ND | 6.1 | ND |
| NLMW-11 | 23-Oct-92 | | ND | ND | ND | ND |
| NLMW-11 | 17-Dec-92 | | ND | ND | ND | ND |
| NLMW-11 | 09-Feb-93 | | ND | ND | ND | ND |
| NLMW-11 | 23-Jun-93 | | ND | ND | ND | ND |
| NLMW-11 | 28-Sep-93 | | ND | ND | ND | ND |
| NLMW-11 | 17-Dec-93 | | 0.4 | ND | ND | ND |
| NLMW-11 | 21-Mar-94 | | 0.5 | ND | ND | ND |
| NLMW-11 | 21-Jun-94 | | ND | ND | ND | ND |
| NLMW-11 | 28-Sep-94 | | ND | ND | ND | ND |
| NLMW-11 | 21-Dec-94 | | ND | ND | ND | ND |
| NLMW-11 | 06-Feb-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| NLMW-11 | 02-Mar-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| NLMW-12 | 28-Aug-92 | | ND | ND | ND | ND |

**Table 2-5: Primary Compounds in Groundwater and Leachate
Junker Landfill - Hudson Township, Wisconsin**

| Well | Date | WDNR ES WDNR PAL Maximum | Trichloro | Tetrachloro | Freon-12 | Freon-11 |
|-----------|-----------|--------------------------------|------------------|------------------|---------------------|---------------------|
| | | | ethene | ethene | | |
| | | | 5 0.5 54.0 | 5 0.5 17.0 | 1000 200 19.0 | 3490 698 35.0 |
| NLMW-12 | 22-Sep-92 | | 0.7 | ND | ND | ND |
| NLMW-12 | 23-Oct-92 | | ND | ND | ND | ND |
| NLMW-12 | 17-Dec-92 | | ND | ND | ND | ND |
| NLMW-12 | 09-Feb-93 | | ND | ND | ND | ND |
| NLMW-12 | 23-Jun-93 | | ND | ND | ND | ND |
| NLMW-12 | 28-Sep-93 | | ND | ND | ND | ND |
| NLMW-12 | 21-Mar-94 | | 0.4 | ND | ND | ND |
| NLMW-12 | 21-Jun-94 | | ND | ND | ND | ND |
| NLMW-12 | 28-Sep-94 | | ND | ND | ND | ND |
| NLMW-12 | 21-Dec-94 | | ND | ND | ND | ND |
| NLMW-12 | 02-Feb-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| NLMW-12 | 02-Mar-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| NLMW-13 | 28-Aug-92 | | ND | ND | ND | ND |
| NLMW-13 | 22-Sep-92 | | 2.3 | 0.8 | 6.8 | 5.8 |
| NLMW-13 | 23-Oct-92 | | 3.1 | 1.8 | ND | 4.1 |
| NLMW-13 | 17-Dec-92 | | 0.6 | ND | ND | ND |
| NLMW-13 | 09-Feb-93 | | 2.1 | ND | ND | 2.9 |
| NLMW-13 | 29-Mar-93 | | 1.8 | ND | ND | 2.1 |
| NLMW-13 | 23-Jun-93 | | 1.5 | 0.5 | ND | 2.5 |
| NLMW-13 | 28-Sep-93 | | 1.8 | 0.5 | ND | 1.8 |
| NLMW-13 | 17-Dec-93 | | 1.7 | 0.5 | ND | 1.2 |
| NLMW-13 | 21-Mar-94 | | 1.9 | 0.6 | ND | ND |
| NLMW-13 | 21-Jun-94 | | 0.6 | ND | ND | 1.9 |
| NLMW-13 | 28-Sep-94 | | 2.0 | ND | ND | ND |
| NLMW-13 | 21-Dec-94 | | 1.2 | ND | ND | 1.7 |
| NLMW-13 | 06-Feb-95 | | J 1 | <2.5 | <1.7 | J 9 |
| NLMW-13 | 02-Mar-95 | | J 1 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| WDNR-50D | 16-Sep-91 | | <0.5 | <0.5 | <5.0 | <1.0 |
| WDNR-50D | 14-Oct-91 | | <0.5 | <0.5 | <5.0 | <1.0 |
| WDNR-50D | 02-Feb-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| WDNR-50D | 01-Mar-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| WDNR-50S | 15-Jun-92 | | 1.4 | NA | NA | NA |
| WDNR-50S | 22-Sep-92 | | ND | NA | NA | NA |
| WDNR-50S | 17-Dec-92 | | ND | NA | NA | NA |
| WDNR-50S | 21-Jun-93 | | ND | NA | NA | NA |
| WDNR-50S | 23-Jun-93 | | ND | NA | NA | NA |
| WDNR-50S | 17-Dec-93 | | ND | NA | NA | NA |
| WDNR-50S | 21-Dec-93 | | ND | NA | NA | NA |
| WDNR-50S | 01-Feb-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| WDNR-50S | 01-Mar-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| WW-11 | 21-Feb-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| WW-11 | 09-Mar-95 | | J 0.9 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| WW-12 | 31-Jan-95 | | <0.5 | <2.5 | 7 | <0.8 |
| WW-12 dup | 31-Jan-95 | | <0.5 | <2.5 | 18 | <0.8 |
| WW-12 | 28-Feb-95 | | <0.5 | <2.5 | J 4 | J 15 |
| WW-12 dup | 28-Feb-95 | | <0.5 | <2.5 | J 5 | <0.8 |
| | | | | | | |
| WW-13 | 09-Feb-95 | | 13 | <2.5 | <1.7 | <0.8 |
| WW-13 dup | 09-Feb-95 | | 13 | <2.5 | J 17 | <0.8 |
| WW-13 | 09-Mar-95 | | 15 | <2.5 | J 2 | J 4 |
| WW-13 dup | 09-Mar-95 | | 17 | <2.5 | J 2 | 5 |
| | | | | | | |
| WW-14 | 09-Feb-95 | | <0.5 | <2.5 | 5 | <0.8 |
| WW-14 | 07-Mar-95 | | J 0.7 | <2.5 | <1.7 | <0.8 |
| | | | | | | |
| WW-15A | 07-Feb-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| WW-15A | 07-Mar-95 | | J 1 | <2.5 | <1.7 | <0.8 |

**Table 2-5: Primary Compounds in Groundwater and Leachate
Junker Landfill - Hudson Township, Wisconsin**

| Well | Date | WDNR ES | Trichloro ethene | Tetrachloro ethene | Freon-12 | Freon-11 |
|-----------|-----------|----------|---------------------|-----------------------|----------|----------|
| | | WDNR PAL | 5 | 5 | 1000 | 3490 |
| | | Maximum | 0.5 | 0.5 | 200 | 698 |
| | | | 54.0 | 17.0 | 19.0 | 35.0 |
| WW-15B | 07-Feb-95 | | J 4 | <2.5 | J 4 | J 3 |
| WW-15B | 07-Mar-95 | | J 3 | <2.5 | <1.7 | <0.8 |
| WW-15C | 07-Feb-95 | | J 4 | <2.5 | J 3 | J 2 |
| WW-15C | 07-Mar-95 | | J 4 | <2.5 | <1.7 | <0.8 |
| WW-16 | 15-Mar-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| WW-16 | 08-Mar-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| WW-16 dup | 08-Mar-95 | | <0.5 | <2.5 | <1.7 | <0.8 |
| GEW #7 | 21-Dec-94 | | J 1 | J 1 | NA | NA |
| GEW #7 | 09-Feb-95 | | <5 | <25 | <17 | <8 |
| GEW #8 | 09-Feb-95 | | <5 | <25 | <17 | <8 |
| GEW #9 | 09-Feb-95 | | <5 | <25 | <17 | <8 |
| GEW #9 | 21-Dec-94 | | J 0.9 | 2 | NA | NA |
| GEW #10 | 09-Feb-95 | | <5 | <25 | <17 | <8 |
| LHW-1 | 26-Jun-90 | | <2 | <5 | <20 | <10 |
| LHW-1 | 24-Sep-91 | | <2 | <1 | <1 | <1 |
| LHW-1 | 03-Mar-92 | | <1 | <1 | 6.6 | NA |
| LHW-1 | 21-Sep-92 | | <3.3 | <3.3 | <3.3 | NA |
| LHW-1 | 02-Mar-93 | | <1 | <1 | <1 | NA |
| LHW-1 | 22-Jun-93 | | <1 | <1 | <1 | NA |
| LHW-1 | 09-Feb-95 | | <5 | <25 | <17 | <8 |
| LHW-2 | 26-Jun-90 | | <2 | <5 | <20 | <10 |

Note: Trichloroethene, Tetrachloroethene, Freon-12, and Freon-11 reflect data validation corrections.
Refer to Appendix D for all other data validation flags.
< symbol (i.e. <0.5) implies concentration less than detection limits.
Refer to Appendix N for results from QA/QC samples.

WDNR ES= Wisconsin Department of Natural Resources Enforcement Standard
BEQL = Below Estimated Quantitation Limits
BMDL = Below Minimum Detection Limits
NA = Not Analyzed
ND = Not Detected
dup = Duplicate sample analyzed by GC/MS
* = Compound identified in corresponding method blank
or trip blank at comparable level.
** = Chloromethane as identified by GC analysis later
revealed by GC/MS to be dichlorodifluoromethane.
*** = Compound concentration from EPA SW-846 8270 analysis.
All concentrations in micrograms/liter (ug/l).

Table 2-6: Hydraulic Conductivities
Junker Landfill - Hudson Township, Wisconsin

| Location | Hydraulic Conductivity (feet/day) | Stress Method | Method of Analysis | Comments |
|---------------------------|--------------------------------------|------------------|-----------------------|-------------|
| Prairie du Chien*: | | | | |
| WW-12 | 10.1 | Slug Test | Bouwer & Rice | Dissipation |
| WW-12 | 13.0 | Slug Test | Bouwer & Rice | Recovery |
| WW-15A | 31.5 | Slug Test | Bouwer & Rice | Dissipation |
| WW-15A | 47.2 | Slug Test | Bouwer & Rice | Recovery |
| Arithmetic Mean: | 25.5 | | | |
| Geometric Mean: | 21.0 | | | |
| Leachate: | | | | |
| GEW-7 | 1.3 | Pumping Test | Modified Thies | Recovery |
| GEW-8 | 0.5 | Pumping Test | Modified Thies | Recovery |
| GEW-9 | 26.7 | Pumping Test | Modified Thies | Recovery |
| LHW-1 | 0.9 | Pumping Test | Modified Thies | Recovery |
| Arithmetic Mean: | 7.4 | | | |
| Geometric Mean: | 2.0 | | | |

* Note: Analysis of test based on single porosity system.

**Table 2-7: GEW8 and GEW9 Vacuum Investigation Data
Junker Landfill - Hudson Township, Wisconsin**

| Location | Date | Time | Depth (feet) | Elev. (feet ngvd) | Press. (Inches H2O) | Flow (cfm) | Comments |
|--------------------------------|-----------|----------|-----------------|----------------------|------------------------|---------------|---|
| GP1 LF (Gnd. elev. 1021.1) | 26-Jan-95 | 07:00 AM | 20 | 1001.1 | -0.09 | | 15 minutes for reading to stabilize reading after open for 1 hour water observed on punch rod tip grit/moisture clog (separate borehole) |
| | | | 30 | 991.1 | -0.75 | | |
| | | | 30 | 991.1 | 0.38 | | |
| | | 11:40 AM | 32 | 989.1 | 0.38 | | |
| | | 02:20 PM | 30 | 991.1 | 2.36 | | |
| GP2 LF (Gnd. elev. 1020.7) | 26-Jan-95 | 09:50 AM | 20 | 1000.7 | -0.13 | | |
| GP 3 LF (Gnd. elev. 1018.8) | 26-Jan-95 | 10:10 AM | 20 | 998.8 | -0.05 | | |
| GP4 LF (Gnd. elev. 1012.7) | 26-Jan-95 | 03:20 PM | 10 | 1002.7 | 0.03 | | |
| | | | 20 | 992.7 | 0.02 | | |
| | | | 30 | 982.7 | 0.04 | | |
| | | | 40 | 972.7 | 0.05 | | |
| VENT 1 | 26-Jan-95 | 09:20 AM | | | -0.14 | | |
| | | 02:30 PM | | | 0.13 | | |
| VENT 4 | 26-Jan-95 | 09:20 AM | | | -0.15 | | |
| | | 11:15 AM | | | -0.03 | | |
| | | 02:30 PM | | | 0.14 | | |
| GEW8 | 26-Jan-95 | 09:20 AM | | 1008.7 | | 33 | measurement at well-head |
| | | 02:00 PM | | 1008.7 | -5.30 | | |
| | | 02:00 PM | | 1008.7 | | 34 | |
| GEW9 | 26-Jan-95 | 09:20 AM | | 1007.6 | | 14 | measurement at well-head |
| | | 02:00 PM | | 1007.6 | -2.30 | | |
| | | 02:00 PM | | 1007.6 | | 14 | |

Notes:

- 1) Pressure readings taken with a Neotronics PDM-205 micromanometer.
- 2) Elevations for GEW8 and GEW9 are approximate top of well screens which extend to base of landfill as taken from Ayres October 1993 Construction Documentation Report.

Table 2-8a: Gas Monitoring Well Data
Junker Landfill - Hudson Township, Wisconsin

| Date | Time | Sampler | GMW-1A | | | | GMW-1B | | | | MW-7 | | | | GMW-2A | | | |
|-----------|------|---------|--------------------|--------------------------|-----------------|--------------------------|--------------------|--------------------------|-----------------|--------------------------|--------------------|--------------------------|-----------------|--------------------------|--------------------|--------------------------|-----------------|--------------------------|
| | | | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) |
| 20-Dec-89 | | CWE | | | 17.8 | | | | 21.0 | | | | 8.1 | | | | 9.1 | |
| 31-Jan-90 | | CWE | | | 12.8 | | | | 7.4 | | | | 9.2 | | | | 5.6 | |
| 06-Mar-90 | | CWE | | | 20.8 | | | | 20.7 | | | | 11.4 | | | | 7.0 | |
| 22-May-90 | | CWE | | | -- | | | | -- | | | | -- | | | | -- | |
| 06-Jul-90 | | CWE | | | 8.0 | | | | 13.4 | | | | 10.8 | | | | 4.5 | |
| 21-Sep-90 | | CWE | | | 4.7 | | | | 0.9 | | | | 6.0 | | | | 0.4 | |
| 19-Dec-90 | | CWE | | | 20.8 | | | | 20.8 | | | | 20.7 | | | | 0.7 | |
| 25-Sep-91 | | CWE | | | 20.8 | | | | 20.8 | | | | 20.8 | | | | 1.1 | |
| 19-Nov-91 | | CWE | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 50.0 | | 2.3 | |
| 03-Dec-91 | | CWE | 0.0 | | 20.8 | | -- | | -- | | 0.0 | | 20.8 | | 0.0 | | 21.1 | |
| 10-Dec-91 | | CWE | 39.0 | | 0.4 | | 45.0 | | 0.4 | | 0.0 | | 20.8 | | 62.0 | | 0.7 | |
| 17-Dec-91 | | CWE | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 65.0 | | 0.6 | |
| 23-Dec-91 | | CWE | 39.0 | | 0.5 | | 46.0 | | 0.6 | | 14.0 | | 16.2 | | 62.0 | | 0.7 | |
| 30-Dec-91 | | CWE | 36.0 | | 0.5 | | 44.0 | | 0.5 | | 24.0 | | 11.2 | | 58.0 | | 0.5 | |
| 07-Jan-92 | | CWE | 38.0 | | 0.5 | | 43.0 | | 0.5 | | 53.0 | | 1.3 | | 58.0 | | 0.6 | |
| 14-Jan-92 | | CWE | 27.0 | | 0.4 | | 32.0 | | 0.5 | | 40.0 | | 0.5 | | 44.0 | | 0.5 | |
| 21-Jan-92 | | CWE | 21.0 | | 0.3 | | 34.0 | | 0.3 | | 29.0 | | 0.7 | | 46.0 | | 0.5 | |
| 28-Jan-92 | | CWE | 32.0 | | 0.7 | | 35.0 | | 0.7 | | 36.0 | | 0.7 | | 44.0 | | 0.5 | |
| 04-Feb-92 | | CWE | 29.0 | | 0.5 | | 36.0 | | 0.5 | | 24.0 | | 7.4 | | 46.0 | | 0.7 | |
| 10-Feb-92 | | CWE | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 17.0 | | 7.4 | | 44.0 | | 0.7 | |
| 17-Feb-92 | | CWE | 31.0 | | 0.5 | | 36.0 | | 0.5 | | 33.0 | | 0.7 | | 44.0 | | 0.5 | |
| 25-Feb-92 | | CWE | 30.0 | | 1.0 | | 36.0 | | 1.0 | | 32.0 | | 4.3 | | 40.0 | | 0.9 | |
| 03-Mar-92 | | CWE | 13.0 | | 0.6 | | 36.0 | | 0.7 | | 30.0 | | 3.0 | | 48.0 | | 0.7 | |
| 10-Mar-92 | | CWE | 35.0 | | 0.6 | | 40.0 | | 0.6 | | 42.0 | | 1.7 | | 52.0 | | 0.5 | |
| 16-Mar-92 | | CWE | 37.0 | | 0.6 | | 41.0 | | 0.6 | | 45.0 | | 0.6 | | 47.0 | | 0.6 | |
| 23-Mar-92 | | CWE | 18.0 | | 2.4 | | 26.0 | | 2.6 | | 28.0 | | 3.5 | | 26.0 | | 4.1 | |
| 30-Mar-92 | | CWE | 28.0 | | 4.2 | | 44.0 | | 0.5 | | 50.0 | | 3.6 | | 20.0 | | 2.4 | |
| 06-Apr-92 | | CWE | 34.0 | | 1.9 | | 39.0 | | 4.0 | | 10.0 | | 18.9 | | 46.0 | | 0.7 | |
| 14-Apr-92 | | CWE | 38.0 | | 1.8 | | 40.0 | | 2.2 | | 46.0 | | 1.3 | | 48.0 | | 2.0 | |
| 20-Apr-92 | | CWE | 40.0 | | 7.2 | | 40.0 | | 5.0 | | 40.0 | | 5.4 | | 48.0 | | 8.0 | |
| 27-Apr-92 | | CWE | 32.0 | | 1.4 | | 38.0 | | 1.0 | | 38.0 | | 3.4 | | 48.0 | | 0.5 | |
| 04-May-92 | | CWE | 34.0 | | 0.9 | | 40.0 | | 1.0 | | 32.0 | | 3.0 | | 52.0 | | 0.9 | |
| 11-May-92 | | CWE | 34.0 | | 3.0 | | 34.0 | | 2.3 | | 24.0 | | 3.0 | | 46.0 | | 1.2 | |
| 18-May-92 | | CWE | 34.0 | | 6.0 | | 38.0 | | 5.0 | | 20.0 | | 4.0 | | 44.0 | | 2.0 | |
| 26-May-92 | | CWE | 34.0 | | 2.5 | | 34.0 | | 1.0 | | 30.0 | | 3.0 | | 46.0 | | 2.0 | |
| 15-Jun-92 | | CWE | 34.0 | | 1.0 | | 20.0 | | 1.0 | | 12.0 | | 1.0 | | 48.0 | | 1.0 | |
| 20-Jul-92 | | CWE | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 48.0 | | 5.0 | |
| 17-Aug-92 | | CWE | 28.0 | | 2.0 | | -- | | -- | | 6.0 | | 2.0 | | 42.0 | | 2.0 | |
| 21-Sep-92 | | CWE | -- | | -- | | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 0.0 | | 20.8 | |
| 02-Dec-92 | | CWE | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 0.0 | | 20.8 | |
| 14-Dec-92 | | Terra | 25.5 | 28.9 | 0.0 | | 28.6 | 30.7 | 0.0 | slight + | 27.2 | 0.0 | 0.0 | 0.5 | 54.5 | 40.0 | 0.0 | slight + |
| 06-Jan-93 | | Terra | 9.4 | 11.4 | 9.4 | 0.5 | 12.7 | 11.8 | 10.8 | 0.5 | | | | | 50.6 | 34.9 | 0.6 | 0.5 |
| 12-Jan-93 | | Terra | 11.5 | 15.3 | 7.0 | 0.5 | 16.9 | 18.2 | 6.2 | 0.5 | | | | | 18.0 | 11.3 | 11.3 | 0.1 |
| 18-Jan-93 | | Terra | 0.0 | 0.0 | 19.5 | | 0.1 | 0.4 | 19.2 | | | | | | 1.5 | 0.7 | 18.5 | |
| 25-Jan-93 | | Terra | | | | | | | | | | | | | | | | |
| 04-Feb-93 | | Terra | 0.0 | 0.0 | 19.8 | | 0.0 | 0.0 | 19.7 | | | | | | 42.5 | 30.4 | 1.0 | |
| 11-Feb-93 | | Terra | 0.6 | 1.4 | 17.5 | slight + | 2.7 | 3.7 | 16.5 | slight + | 15.4 | 19.7 | 4.5 | | 49.5 | 34.8 | 1.4 | slight + |
| 05-Mar-93 | | Terra | 9.1 | 24.0 | 0.1 | 0.0 | 0.4 | 1.0 | 20.0 | 0.0 | 14.3 | 19.4 | 2.1 | | 55.1 | 39.3 | 0.3 | 0.0 |
| 02-Apr-93 | | Terra | 5.6 | 20.4 | 0.0 | 0.0 | 6.9 | 10.9 | 0.0 | 0.0 | 13.4 | 19.9 | 0.0 | 0.0 | 59.8 | 40.0 | 0.0 | 0.0 |
| 08-Apr-93 | | Terra | 2.6 | 6.9 | 0.0 | 0.0 | 11.7 | 25.3 | 0.0 | slight + | 0.6 | 0.2 | 19.5 | 0.0 | 59.8 | 40.0 | 0.0 | slight + |
| 13-Apr-93 | | Terra | 7.8 | 23.2 | 0.0 | 0.5 | 12.5 | 25.9 | 0.0 | 0.5 | 13.8 | 20.1 | 0.0 | 0.25 | 60.4 | 39.9 | 0.0 | 0.5 |
| 23-Apr-93 | | Terra | 6.3 | 22.8 | 0.0 | 0.0 | 7.9 | 23.9 | 0.0 | 0.0 | 15.7 | 22.6 | 0.0 | 0.0 | 57.5 | 40.7 | 0.0 | 0.0 |

Table 2-8a: Gas Monitoring Well Data
Junker Landfill - Hudson Township, Wisconsin

| Date | Time | Sampler | GMW-1A | | | | GMW-1B | | | | MW-7 | | | | GMW-2A | | | |
|-----------|----------|---------|--------------------|---------------------------|------------------|--------------------------|--------------------|---------------------------|------------------|--------------------------|--------------------|---------------------------|------------------|--------------------------|--------------------|---------------------------|------------------|--------------------------|
| | | | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Pressure (inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Pressure (inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Pressure (inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Pressure (inches H2O) |
| 29-Apr-93 | | Terra | 0.0 | 2.0 | 17.4 | 0.0 | 0.5 | 1.1 | 19.9 | 0.0 | 15.3 | 18.8 | 0.0 | 0.0 | 48.0 | 34.2 | 0.0 | 0.0 |
| 06-May-93 | | Terra | 0.0 | 0.0 | 21.0 | 0.0 | 0.0 | 0.0 | 20.9 | -0.04 | 0.0 | 0.0 | 21.0 | 0.0 | 0.0 | 0.0 | 20.4 | -0.02 |
| 12-May-93 | | Terra | 0.5 | 0.0 | 22.0 | -0.25 | 0.3 | 0.0 | 21.0 | 0.0 | 0.5 | 0.0 | 21.7 | 0.0 | 51.8 | 41.6 | 0.0 | 0.0 |
| 20-May-93 | | Terra | 0.0 | 0.5 | 19.1 | 0.0 | 0.2 | 2.8 | 17.2 | 0.0 | 14.0 | 15.6 | 0.0 | 0.0 | 51.9 | 40.3 | 0.0 | 0.0 |
| 10-Jun-93 | | Terra | 0.1 | 0.0 | 21.0 | -0.25 | 0.0 | 0.0 | 21.2 | -0.5 | 0.0 | 0.0 | 20.6 | -0.25 | 0.0 | 0.0 | 20.9 | 0.0 |
| 24-Jun-93 | | Terra | 0.3 | 0.0 | 20.8 | -0.5 | 0.2 | 0.0 | 20.8 | -0.5 | 0.3 | 0.0 | 20.8 | -0.5 | 0.3 | 0.0 | 20.8 | -0.25 |
| 06-Jul-93 | | Terra | 0.2 | 0.0 | 21.4 | 0.0 | 0.2 | 0.0 | 21.3 | 0.0 | 0.1 | 0.0 | 21.8 | 0.0 | 0.2 | 0.0 | 22.0 | 0.0 |
| 20-Jul-93 | | Terra | 0.0 | 0.0 | 21.9 | 0.0 | 0.0 | 0.0 | 21.9 | 0.0 | 0.0 | 0.0 | 22.0 | 0.0 | 49.8 | 41.0 | 0.0 | 0.0 |
| 03-Aug-93 | | Terra | 0.0 | 0.0 | 21.3 | slight - | 0.0 | 0.0 | 21.3 | slight - | 0.0 | 0.0 | 21.2 | slight - | 0.0 | 0.0 | 21.0 | 0.0 |
| 16-Aug-93 | | Terra | 0.0 | 0.8 | 19.1 | slight + | 0.0 | 0.3 | 19.9 | 0.0 | 0.0 | 0.0 | 20.9 | 0.0 | 49.3 | 40.1 | 0.0 | 0.25 |
| 30-Sep-93 | | Terra | 0.1 | 4.3 | 16.4 | 0.5 | 2.0 | 18.5 | 0.0 | 0.5 | 4.9 | 4.7 | 16.5 | 0.0 | 49.5 | 39.7 | 0.0 | 0.5 |
| 02-Nov-93 | | Terra | 0.1 | 16.8 | 9.8 | 0.0 | 0.6 | 19.7 | 9.3 | 0.0 | 0.8 | 1.2 | 19.9 | 0.0 | 56.7 | 43.2 | 1.7 | 0.25 |
| 01-Dec-93 | | Terra | 0.0 | 19.6 | 0.0 | slight + | 0.4 | 20.7 | 0.0 | slight + | 2.5 | 2.8 | 18.8 | 0.0 | 62.3 | 42.0 | 0.0 | 0.5 |
| 30-Dec-93 | | Terra | 0.0 | 16.0 | 8.0 | 0.0 | 0.0 | 17.0 | 8.5 | slight + | 21.4 | 24.3 | 2.6 | 0.0 | 74.2 | 52.3 | 0.0 | 0.0 |
| 10-Feb-94 | | Terra | 0.0 | 14.0 | 5.9 | 0.0 | 0.0 | 14.7 | 5.1 | 0.0 | 17.5 | 21.8 | 0.3 | 0.0 | 57.8 | 39.3 | 0.3 | slight + |
| 03-Mar-94 | | Terra | 0.0 | 8.6 | 12.2 | 0.0 | 0.0 | 8.6 | 6.2 | 0.0 | 3.0 | 8.8 | 14.8 | 0.0 | 64.9 | 49.2 | 0.0 | 0.0 |
| 28-Mar-94 | | Terra | 0.0 | 0.0 | 21.2 | 0.0 | 0.0 | 0.0 | 21.3 | 0.0 | 0.0 | 0.0 | 21.1 | 0.0 | 0.0 | 0.0 | 21.3 | 0.0 |
| 27-Apr-94 | | Terra | 0.0 | 0.0 | 21.3 | 0.0 | 0.0 | 0.0 | 21.3 | -0.5 | 0.0 | 0.0 | 21.1 | -0.5 | 0.0 | 0.0 | 21.0 | 0.0 |
| 03-Jun-94 | | Terra | 0.0 | 13.5 | 10.7 | slight + | 0.0 | 15.6 | 8.7 | slight + | 11.3 | 32.3 | 1.3 | 0.0 | 48.1 | 51.2 | 0.7 | slight + |
| 07-Jul-94 | | Terra | 0.0 | 13.2 | 10.1 | 0.0 | 0.0 | 15.3 | 7.7 | 0.5 | 8.7 | 26.9 | 0.8 | 0.0 | 53.9 | 46.1 | 0.3 | 0.0 |
| 02-Aug-94 | | Terra | 0.0 | 0.3 | 20.9 | 0.0 | 0.0 | 3.6 | 16.9 | 0.0 | 0.0 | 0.0 | 22.3 | 0.0 | 0.0 | 0.0 | 22.4 | 0.0 |
| 01-Sep-94 | | Terra | 0.0 | 1.5 | 20.6 | slight + | 0.0 | 2.0 | 19.0 | 0.0 | 1.2 | 3.6 | 18.0 | 0.0 | 0.0 | 0.0 | 22.2 | 0.0 |
| 09-Sep-94 | | Terra | 0.0 | 0.6 | 19.7 | 0.0 | 0.0 | 0.0 | 20.4 | 0.0 | 0.0 | 0.0 | 20.3 | 0.0 | 39.5 | 42.1 | 0.2 | 0.0 |
| 15-Sep-94 | | Terra | 0.0 | 11.1 | 8.6 | 0.5 | 0.0 | 12.6 | 6.4 | 0.25 | 0.1 | 1.6 | 21.9 | 0.0 | 43.7 | 44.2 | 0.3 | 0.25 |
| 21-Sep-94 | | Terra | 0.0 | 7.0 | 11.6 | 0.0 | 0.0 | 5.5 | 13.3 | 0.0 | 0.4 | 0.7 | 19.2 | 0.0 | 48.4 | 46.4 | 0.2 | 0.0 |
| 29-Sep-94 | | Terra | 0.0 | 10.0 | 9.9 | slight + | 0.0 | 10.4 | 7.9 | slight + | 0.2 | 0.9 | 19.5 | slight + | 50.3 | 42.2 | 0.3 | slight + |
| 05-Oct-94 | | Terra | 0.0 | 10.2 | 8.9 | slight + | 0.0 | 12.1 | 7.0 | slight + | 8.3 | 21.8 | 0.2 | 0.0 | 51.7 | 38.2 | 0.3 | slight + |
| 11-Oct-94 | | Terra | 0.0 | 11.1 | 9.6 | 0.0 | 0.0 | 13.0 | 7.3 | 0.0 | 6.5 | 23.3 | 1.9 | 0.0 | 50.5 | 49.6 | 0.0 | slight + |
| 20-Oct-94 | | Terra | 0.0 | 0.0 | 22.1 | 0.0 | 0.0 | 0.1 | 22.1 | 0.0 | 0.0 | 0.0 | 22.3 | 0.0 | 51.6 | 44.5 | 0.0 | 0.0 |
| 26-Oct-94 | | Terra | 0.0 | 5.8 | 17.5 | 0.0 | 0.0 | 12.5 | 8.6 | slight + | 8.8 | 23.0 | 2.4 | 0.0 | 52.0 | 46.5 | 0.4 | slight + |
| 02-Nov-94 | | Terra | 0.0 | 0.0 | 23.6 | 0.0 | 0.0 | 5.3 | 16.4 | 0.0 | 0.2 | 0.0 | 23.5 | 0.0 | 48.2 | 42.6 | 2.3 | 0.0 |
| 09-Nov-94 | | Terra | 0.2 | 0.0 | 22.2 | -0.5 | 0.2 | 0.0 | 22.2 | -0.5 | 0.2 | 0.0 | 22.1 | 0.0 | 0.1 | 0.0 | 22.0 | 0.0 |
| 14-Nov-94 | | Terra | 0.1 | 0.0 | 22.5 | 0.25 | 0.0 | 0.0 | 22.5 | 0.25 | 0.1 | 0.0 | 22.4 | 0.0 | 0.1 | 0.0 | 22.5 | 0.0 |
| 21-Nov-94 | | Terra | 0.0 | 0.0 | 22.6 | 0.0 | 0.0 | 0.0 | 22.6 | -0.5 | 0.0 | 0.0 | 22.6 | -0.5 | 0.0 | 0.0 | 22.5 | 0.0 |
| 01-Dec-94 | | Terra | 0.0 | 1.9 | 20.7 | 0.0 | 0.0 | 1.9 | 20.7 | 0.0 | 10.8 | 23.7 | 0.0 | 0.0 | 45.9 | 42.0 | 0.0 | 0.0 |
| 07-Dec-94 | | Terra | 0.0 | 0.0 | 23.0 | 0.5 | 0.0 | 0.0 | 23.1 | 0.1 | 0.0 | 0.0 | 23.1 | 0.0 | 0.0 | 0.0 | 23.4 | 0.1 |
| 13-Dec-94 | 08:00 AM | WDNR | | | | | | | | | | | | | | | | |
| 13-Dec-94 | 11:30 AM | Wenck | 1% LEL | | 10.7 | | 1% LEL | | 8.2 | | 7.5 | | 11.1 | | 43 | | 0.3 | |
| 13-Dec-94 | 11:30 AM | Terra | 0.0 | 10.0 | 11.5 | 0.0 | 0.0 | 11.3 | 9.9 | 0.0 | 4.7 | 9.1 | 13.1 | 0 | 42.8 | 40.6 | 0.4 | 0 |
| 14-Dec-94 | 03:00 PM | Wenck | 1% LEL | | 9.7 | | 1% LEL | | 8.2 | | 11 | | 0.2 | | 41 | | 0.1 | |
| 15-Dec-94 | 10:30 AM | Wenck | 1% LEL | | 12.9 | | 1% LEL | | 9.2 | | 12 | | 0.3 | | 46 | | 0.2 | |
| 16-Dec-94 | 09:00 AM | Wenck | 1% LEL | | 11.7 | | 1% LEL | | 8.7 | | 6% LEL | | 0.8 | | 37.0 | | 0.2 | |
| 16-Dec-94 | 12:00 PM | Wenck | 1% LEL | | 10.5 | | 1% LEL | | 8.4 | | 1% LEL | | 0.2 | | 40 | | 0 | |
| 17-Dec-94 | 08:20 AM | Wenck | 1% LEL | | 15.3 | | 1% LEL | | 14.4 | | 1% LEL | | 20.5 | | 42 | | 0.2 | |
| 17-Dec-94 | 12:00 PM | Wenck | 1% LEL | | 20.8 | | 1% LEL | | 20.6 | | 1% LEL | | 20.8 | | 40 | | 0.3 | |
| 19-Dec-94 | 01:30 PM | Wenck | 1% LEL | | 10.6 | | 1% LEL | | 14.2 | | 50% LEL (max.) | | 0.1 | | 50 | | 0.1 | |
| 19-Dec-94 | 03:40 PM | Wenck | 1% LEL | | 11.0 | | 1% LEL | | 20.4 | | 5% LEL | | 20.0 | | 50 | | 0.1 | |
| 20-Dec-94 | 09:00 AM | Wenck | 1% LEL | | 20.5 | | 1% LEL | | 20.5 | | 1% LEL | | 20.4 | | 49 | | 0.2 | |
| 21-Dec-94 | 08:00 AM | Wenck | 1% LEL | | 20.0 | | 1% LEL | | 20.0 | | 1% LEL | | 20.0 | | 57 | | 0.1 | |
| 21-Dec-94 | 02:20 PM | Wenck | 1% LEL | | 20.0 | | 1% LEL | | 20.0 | | 12 | | 3.2 | | 57 | | 0.1 | |
| 22-Dec-94 | 11:20 AM | Wenck | 1% LEL | | 20.3 | | 1% LEL | | 11.7 | | 1% LEL | | 20.1 | | 57 | | 0 | |
| 23-Dec-94 | 02:43 PM | Wenck | 1% LEL | | 14.5 | | 1% LEL | | 9.4 | | 19% LEL | | 2 | | 54 | | 0 | |

Table 2-8a: Gas Monitoring Well Data
Junker Landfill - Hudson Township, Wisconsin

| Date | Time | Sampler | GMW-1A | | | | GMW-1B | | | | MW-7 | | | | GMW-2A | | | |
|-----------|----------|---------|--------------------|---------------------------|------------------|--------------------------|--------------------|---------------------------|------------------|--------------------------|--------------------|---------------------------|------------------|--------------------------|--------------------|---------------------------|------------------|--------------------------|
| | | | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Pressure (Inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Pressure (Inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Pressure (Inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Pressure (Inches H2O) |
| 24-Dec-94 | 09:25 AM | Wenck | 1% LEL | | 15.5 | | 1% LEL | | 11.4 | | 19% LEL | | 1.5 | | 58 | | 0.2 | |
| 26-Dec-94 | 10:40 AM | Wenck | 1% LEL | | 17.5 | | 1% LEL | | 8.8 | | 1% LEL | | 18.6 | | 62 | | 0.2 | |
| 27-Dec-94 | | Terra | | | | | | | | | | | | | | | | |
| 27-Dec-94 | | Terra | 0.0 | 10.4 | 11.5 | slight + | 0.0 | 11.6 | 10.1 | slight + | 12.6 | 26.1 | 0.8 | slight + | 53.2 | 44.9 | 1.0 | slight + |
| 06-Jan-95 | | Terra | 0.0 | 22.1 | 1.4 | 0.0 | 0.0 | 0.0 | 23.4 | 0.0 | 0.0 | 0.0 | 23.7 | 0.0 | 0.0 | 0.0 | 23.0 | 0.0 |
| 10-Jan-95 | | Terra | 0.0 | 11.5 | 10.5 | 0.0 | 0.0 | 11.2 | 10.0 | 0.0 | 9.7 | 21.7 | 1.3 | 0.0 | 44.8 | 33.5 | 1.7 | 0.0 |
| 18-Jan-95 | | Terra | 0.0 | 22.9 | 0.0 | 0.0 | 0.0 | 0.0 | 23.0 | 0.0 | 0.0 | 0.0 | 23.0 | 0.0 | 0.0 | 0.0 | 23.0 | 0.0 |
| 24-Jan-95 | 12:30 PM | Wenck | 0.0 | 0.0 | 21.0 | | 0.0 | 0.2 | 20.6 | | 2.3 | 3.4 | 16.1 | | 37.8 | 35.0 | 2.9 | |
| 25-Jan-95 | 08:50 AM | Wenck | 0.0 | 0.0 | 21.0 | | 0.0 | 0.0 | 21.0 | | 0.0 | 0.0 | 21.1 | | 30.0 | 1.8 | 19.3 | |
| 26-Jan-95 | 09:20 AM | Wenck | | | | 0.01 | | | | 0.01 | | | | 0.03 | | | | -0.03 |
| 26-Jan-95 | 02:30 PM | Wenck | | | | 0.15 | | | | 0.18 | | | | 0.19 | | | | 0.07 |
| 27-Jan-95 | 02:10 PM | Wenck | | | | | | | | | | | | | 0.0 | 0.0 | 20.3 | -0.04 |
| 30-Jan-95 | 09:00 AM | Wenck | | | | | | | | | | | | | 23.5 | 21.2 | 8.0 | 0.00 |
| 30-Jan-95 | 04:40 PM | Wenck | | | | | | | | | | | | | 40.5 | 40.9 | 0.0 | 0.43 |
| 31-Jan-95 | 09:30 AM | Wenck | | | | | | | | | | | | | 0.0 | 0.0 | 20.7 | -0.03 |
| 31-Jan-95 | | Terra | 0.0 | 10.2 | 10.2 | slight + | 0.0 | 11.5 | 8.9 | slight + | 11.4 | 22.0 | 0.1 | slight + | 41.5 | 37.2 | 0.1 | 0.00 |
| 31-Jan-95 | 01:55 PM | Wenck | 0.0 | 10.8 | 9.7 | 0.10 | 0.0 | 12.0 | 8.7 | 0.10 | 11.4 | 24.3 | 0.2 | 0.1 | 42.0 | 44.6 | 0.2 | 0.03 |
| 10-Feb-95 | 08:45 AM | Wenck | 0.0 | 0.0 | 20.1 | -0.45 | 0.0 | 0.0 | 20.1 | -0.45 | 0.0 | 0.0 | 20.1 | -0.50 | 0.0 | 0.0 | 20.1 | -0.30 |
| 17-Feb-95 | 11:30 AM | Wenck | 0.0 | 3.8 | 16.6 | 0.11 | 0.0 | 8.8 | 10.1 | 0.11 | 0.0 | 0.0 | 20.9 | 0.08 | 39.1 | 38.9 | 0.0 | -0.04 |
| 23-Feb-95 | 11:40 AM | Wenck | 0.0 | 0.0 | 20.0 | -0.16 | 0.0 | 0.0 | 20.0 | -0.15 | 0.0 | 0.0 | 20.1 | -0.11 | 0.0 | 0.0 | 20.2 | -0.05 |
| 23-Feb-95 | 03:00 AM | Wenck | 0.0 | 0.0 | 20.2 | -0.24 | 0.0 | 0.0 | 20.2 | -0.30 | 0.0 | 0.0 | 20.2 | -0.30 | 0.0 | 0.0 | 20.3 | -0.18 |
| 24-Feb-95 | 09:30 AM | Wenck | 0.0 | 9.0 | 11.3 | 0.04 | 0.0 | 10.0 | 9.3 | 0.06 | 7.1 | 13.9 | 4.9 | 0.03 | 37.0 | 37.0 | 0.0 | 0.03 |
| 24-Feb-95 | 03:20 AM | Wenck | 0.0 | 9.6 | 10.3 | 0.13 | 0.0 | 11.2 | 8.3 | 0.15 | 11.2 | 23.0 | 0.0 | 0.14 | 38.7 | 39.7 | 0.0 | 0.15 |
| 27-Feb-95 | 12:00 PM | Wenck | 0.0 | 0.0 | 20.3 | 0.00 | 0.0 | 0.0 | 20.3 | 0.00 | 0.0 | 0.0 | 20.3 | 0.02 | 0.0 | 0.0 | 20.3 | 0.05 |
| 28-Feb-95 | 02:15 AM | Wenck | 0.0 | 8.3 | 12.6 | 0.02 | 0.0 | 0.0 | 20.1 | 0.02 | 7.9 | 17.2 | 3.2 | 0.03 | 36.0 | 36.2 | 0.0 | 0.00 |
| 01-Mar-95 | 01:40 AM | Wenck | 0.0 | 0.0 | 19.8 | -0.02 | 0.0 | 0.2 | 19.5 | 0.00 | 8.5 | 19.7 | 1.9 | 0.04 | 29.2 | 35.7 | 0.0 | 0.06 |
| 10-Mar-95 | 02:40 AM | Wenck | 0.0 | 9.5 | 10.2 | 0.12 | 0.0 | 10.9 | 8.4 | 0.09 | 8.3 | 21.7 | 0.0 | 0.08 | 28.5 | 33.2 | 0.0 | 0.05 |

Notes:

All measurements in percent volume unless otherwise noted.
 All Wenck measurements taken by Digi-Flam 2000 in 1994 unless otherwise noted; 1995 measurements taken by Landtec GEM-500.
 Wenck pressure measurements taken by Neutronics PDM 205.
 December 20, 1989 through December 2, 1992 data taken from Groundwater and Gas Monitoring Report dated January 1993 by Central Wisconsin Engineers.
 December 14, 1992 through December 30, 1993 data taken from Long Term Care Quarterly Report to WDNR dated January 20, 1994 by Terra Engineering & Construction Corp.
 February 10, 1994 through January 31, 1995 Terra data taken from Long Term Care, Summary: January 1995 report to WDNR dated February 10, 1995.

Table 2-8a: Gas Monitoring Well Data
Junker Landfill - Hudson Township, Wisconsin

| Date | Time | Sampler | GMW-2B | | | | GMW-3 | | | | MW-4 | | | | GMW-4A | | | |
|-----------|------|---------|--------------------|--------------------------|-----------------|--------------------------|--------------------|--------------------------|-----------------|--------------------------|--------------------|--------------------------|-----------------|--------------------------|--------------------|--------------------------|-----------------|--------------------------|
| | | | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) |
| 20-Dec-89 | | CWE | | | 10.6 | | | | 2.6 | | | | 7.1 | | | | | |
| 31-Jan-90 | | CWE | | | 3.3 | | | | 6.8 | | | | 0.7 | | | | | |
| 06-Mar-90 | | CWE | | | 4.8 | | | | 20.8 | | | | 20.7 | | | | | |
| 22-May-90 | | CWE | | | -- | | | | -- | | | | -- | | | | | |
| 06-Jul-90 | | CWE | | | 12.2 | | | | 0.5 | | | | 3.4 | | | | | |
| 21-Sep-90 | | CWE | | | 0.4 | | | | 0.6 | | | | 0.4 | | | | | |
| 19-Dec-90 | | CWE | | | 2.3 | | | | 0.5 | | | | 20.7 | | | | | |
| 25-Sep-91 | | CWE | | | 1.1 | | | | 2.5 | | | | 18.4 | | | | | |
| 19-Nov-91 | | CWE | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 0.0 | | 20.7 | | | | | |
| 03-Dec-91 | | CWE | 0.0 | | 20.8 | | 0.0 | | 20.7 | | 0.0 | | 20.8 | | | | | |
| 10-Dec-91 | | CWE | 61.0 | | 0.7 | | 22.0 | | 4.6 | | 1.0 | | 20.4 | | | | | |
| 17-Dec-91 | | CWE | 62.0 | | 0.7 | | 0.0 | | 20.8 | | 0.0 | | 20.8 | | | | | |
| 23-Dec-91 | | CWE | 61.0 | | 0.7 | | 28.0 | | 0.8 | | 0.0 | | 20.7 | | | | | |
| 30-Dec-91 | | CWE | 56.0 | | 0.5 | | 17.0 | | 13.6 | | 0.0 | | 20.7 | | | | | |
| 07-Jan-92 | | CWE | 57.0 | | 0.5 | | 25.0 | | 0.6 | | 11.0 | | 0.9 | | | | | |
| 14-Jan-92 | | CWE | 44.0 | | 0.5 | | 19.0 | | 0.7 | | 3.0 | | 19.3 | | | | | |
| 21-Jan-92 | | CWE | 45.0 | | 0.5 | | 19.0 | | 0.7 | | 5.0 | | 9.4 | | | | | |
| 28-Jan-92 | | CWE | 43.0 | | 0.5 | | 17.0 | | 0.6 | | 4.0 | | 1.0 | | | | | |
| 04-Feb-92 | | CWE | 46.0 | | 0.6 | | 19.0 | | 0.7 | | 2.0 | | 1.9 | | | | | |
| 10-Feb-92 | | CWE | 44.0 | | 0.7 | | 0.0 | | 20.8 | | 0.0 | | 20.7 | | | | | |
| 17-Feb-92 | | CWE | 44.0 | | 0.5 | | 18.0 | | 0.6 | | 3.0 | | 0.9 | | | | | |
| 25-Feb-92 | | CWE | 34.0 | | 1.2 | | 14.0 | | 1.0 | | 2.0 | | 14.7 | | 0.0 | | 20.8 | |
| 03-Mar-92 | | CWE | 47.0 | | 0.7 | | 20.0 | | 0.6 | | 1.0 | | 18.5 | | 19.0 | | 0.7 | |
| 10-Mar-92 | | CWE | 50.0 | | 0.5 | | 21.0 | | 0.7 | | 5.0 | | 4.7 | | 26.0 | | 0.7 | |
| 16-Mar-92 | | CWE | 46.0 | | 0.6 | | 20.0 | | 0.7 | | 11.0 | | 1.3 | | 21.0 | | 0.7 | |
| 23-Mar-92 | | CWE | 48.0 | | 4.4 | | 12.0 | | 2.5 | | 4.0 | | 5.7 | | 8.0 | | 2.8 | |
| 30-Mar-92 | | CWE | 24.0 | | 7.5 | | 20.0 | | 3.3 | | 10.0 | | 6.7 | | 24.0 | | 1.0 | |
| 06-Apr-92 | | CWE | 42.0 | | 2.7 | | 19.0 | | 0.7 | | 9.0 | | 16.7 | | 0.0 | | 20.8 | |
| 14-Apr-92 | | CWE | 48.0 | | 1.2 | | 12.0 | | 1.9 | | 10.0 | | 2.0 | | 26.0 | | 10.0 | |
| 20-Apr-92 | | CWE | 48.0 | | 15.0 | | 18.0 | | 4.5 | | 12.0 | | 11.0 | | 24.0 | | 0.9 | |
| 27-Apr-92 | | CWE | 46.0 | | 0.9 | | 18.0 | | 2.0 | | 2.0 | | 9.6 | | 24.0 | | 0.9 | |
| 04-May-92 | | CWE | 50.0 | | 0.9 | | 12.0 | | 2.6 | | 4.0 | | 19.4 | | 24.0 | | 2.0 | |
| 11-May-92 | | CWE | 44.0 | | 1.5 | | 20.0 | | 2.0 | | 42.0 | | 2.0 | | 20.0 | | 1.7 | |
| 18-May-92 | | CWE | 46.0 | | 1.0 | | 20.0 | | 1.3 | | 8.0 | | 3.0 | | 22.0 | | 3.5 | |
| 26-May-92 | | CWE | 46.0 | | 2.0 | | 12.0 | | 1.5 | | 46.0 | | 3.0 | | 20.0 | | 1.5 | |
| 15-Jun-92 | | CWE | 44.0 | | 1.0 | | 20.0 | | 3.0 | | 28.0 | | 3.0 | | 20.0 | | 3.0 | |
| 20-Jul-92 | | CWE | 48.0 | | 5.0 | | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 0.0 | | 20.8 | |
| 17-Aug-92 | | CWE | 44.0 | | 2.0 | | 18.0 | | 3.0 | | 32.0 | | 2.0 | | 16.0 | | 3.0 | |
| 21-Sep-92 | | CWE | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 0.0 | | 20.8 | | | | | |
| 02-Dec-92 | | CWE | 0.0 | | 20.8 | | 0.0 | | 20.8 | | 0.0 | | 20.8 | | | | | |
| 14-Dec-92 | | Terra | 56.0 | 40.0 | 0.0 | 0.5 | | | | | | | | | 8.7 | 19.9 | 0.0 | slight + |
| 06-Jan-93 | | Terra | 51.9 | 34.0 | 2.0 | 0.5 | | | | | | | | | 6.1 | 14.5 | 4.4 | slight + |
| 12-Jan-93 | | Terra | 47.6 | 31.9 | 2.5 | 0.5 | | | | | | | | | | | | |
| 18-Jan-93 | | Terra | 10.0 | 5.5 | 16.3 | | | | | | | | | | | | | |
| 25-Jan-93 | | Terra | | | | | | | | | | | | | 1.3 | 7.7 | 10.3 | |
| 04-Feb-93 | | Terra | 58.5 | 40.4 | 0.0 | | | | | | | | | | 14.0 | 4.0 | 0.3 | |
| 11-Feb-93 | | Terra | 55.0 | 38.0 | 2.2 | 0.5 | | | | | | | | | 0.2 | 6.7 | 10.9 | slight + |
| 05-Mar-93 | | Terra | 57.6 | 41.1 | 0.3 | 0.0 | | | | | | | | | 0.0 | 1.1 | 18.4 | |
| 02-Apr-93 | | Terra | 60.4 | 40.2 | 0.0 | 0.0 | 0.7 | 0.0 | 20.2 | 0.0 | 0.7 | 4.7 | 13.7 | 0.0 | 1.3 | 16.9 | 0.0 | 0.0 |
| 08-Apr-93 | | Terra | 59.6 | 39.7 | 0.0 | slight + | 0.7 | 0.0 | 19.6 | slight + | 0.5 | 0.0 | 19.6 | 0.0 | 0.5 | 0.0 | 19.6 | 0.0 |
| 13-Apr-93 | | Terra | 81.7 | 40.1 | 0.0 | 0.5 | 1.0 | 8.4 | 12.8 | 0.5 | 0.8 | 9.7 | 0.0 | slight + | 0.9 | 15.3 | 0.0 | 0.5 |
| 23-Apr-93 | | Terra | 59.0 | 41.0 | 0.0 | 0.2 | 0.3 | 7.5 | 13.8 | 0.0 | 1.0 | 13.2 | 0.0 | 0.0 | 0.4 | 0.7 | 19.9 | 0.0 |

Table 2-8a: Gas Monitoring Well Data
Junker Landfill - Hudson Township, Wisconsin

| Date | Time | Sampler | GMW-2B | | | | GMW-3 | | | | MW-4 | | | | GMW-4A | | | |
|-----------|----------|---------|--------------------|--------------------------|-----------------|--------------------------|--------------------|--------------------------|-----------------|--------------------------|--------------------|--------------------------|-----------------|--------------------------|--------------------|--------------------------|-----------------|--------------------------|
| | | | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) |
| 29-Apr-93 | | Terra | 57.4 | 41.3 | 20.0 | 0.0 | 0.1 | 0.0 | 20.5 | 0.0 | 0.0 | 1.2 | 18.7 | 0.0 | 0.0 | 0.0 | 21.3 | -0.01 |
| 06-May-93 | | Terra | 0.0 | 0.0 | 20.7 | 0.0 | 0.0 | 0.0 | 21.0 | 0.04 | 0.0 | 0.0 | 20.6 | 0.0 | 0.0 | 0.0 | 20.9 | -0.02 |
| 12-May-93 | | Terra | 55.4 | 42.6 | 0.0 | 0.0 | 0.0 | 0.0 | 22.0 | 0.0 | 0.0 | 0.0 | 22.1 | 0.0 | 0.0 | 0.0 | 22.3 | 0.0 |
| 20-May-93 | | Terra | 55.6 | 41.7 | 0.0 | 0.0 | 0.0 | 4.3 | 16.2 | 0.0 | 0.0 | 3.1 | 15.3 | 0.0 | 0.0 | 0.3 | 20.0 | 0.0 |
| 10-Jun-93 | | Terra | 0.0 | 0.0 | 21.0 | -0.25 | 0.0 | 0.0 | 21.0 | 0.0 | 0.0 | 0.0 | 21.0 | -0.25 | 0.0 | 0.0 | 21.2 | 0.0 |
| 24-Jun-93 | | Terra | 0.2 | 0.0 | 20.8 | -0.5 | 0.2 | 0.0 | 20.9 | 0.5 | 0.3 | 0.0 | 20.9 | -0.5 | 0.3 | 0.0 | 20.9 | -0.5 |
| 06-Jul-93 | | Terra | 0.1 | 0.0 | 21.9 | 0.0 | 0.1 | 0.0 | 21.9 | 0.0 | 0.2 | 0.0 | 20.8 | 0.0 | 0.2 | 0.0 | 21.2 | slight - |
| 20-Jul-93 | | Terra | 56.3 | 42.0 | 0.0 | 0.0 | 0.2 | 10.4 | 0.0 | 0.0 | 0.3 | 0.0 | 21.8 | 0.0 | 0.0 | 0.0 | 22.1 | 0.0 |
| 03-Aug-93 | | Terra | 46.3 | 35.3 | 0.0 | 0.0 | 0.0 | 0.0 | 21.2 | 0.0 | 0.0 | 0.0 | 21.2 | 0.0 | 0.0 | 0.0 | 21.3 | 0.0 |
| 16-Aug-93 | | Terra | 57.5 | 40.9 | 0.0 | 0.25 | 0.0 | 10.7 | 0.0 | 0.0 | 0.2 | 0.0 | 20.8 | 0.0 | 0.0 | 7.7 | 0.0 | 0.0 |
| 30-Sep-93 | | Terra | 58.6 | 40.4 | 0.0 | 0.5 | 0.3 | 9.7 | 0.0 | 0.25 | 3.6 | 14.8 | 0.0 | 0.5 | 0.0 | 9.7 | 0.0 | 0.5 |
| 02-Nov-93 | | Terra | 61.2 | 43.2 | 3.8 | 0.25 | 0.0 | 11.2 | 11.6 | 0.0 | 0.2 | 2.5 | 17.5 | 0.0 | 0.0 | 8.6 | 13.6 | slight + |
| 01-Dec-93 | | Terra | 69.6 | 42.0 | 0.0 | 0.5 | 0.0 | 10.7 | 10.6 | 0.0 | 0.0 | 11.7 | 6.3 | 0.0 | 0.0 | 9.3 | 8.9 | slight + |
| 30-Dec-93 | | Terra | 77.6 | 52.0 | 0.0 | 0.5 | 0.0 | 0.2 | 19.8 | 0.0 | 0.0 | 0.0 | 20.1 | 0.0 | 0.0 | 13.0 | 9.3 | 0.0 |
| 10-Feb-94 | | Terra | 58.3 | 39.9 | 0.0 | slight + | 0.0 | 7.5 | 13.8 | 0.0 | 0.0 | 0.0 | 20.1 | 0.0 | 0.0 | 9.1 | 8.0 | 0.0 |
| 03-Mar-94 | | Terra | 69.6 | 47.6 | 0.0 | 0.0 | 0.0 | 0.0 | 20.0 | 0.0 | 0.0 | 0.0 | 20.1 | 0.0 | 0.0 | 9.8 | 8.8 | slight + |
| 28-Mar-94 | | Terra | 0.0 | 0.0 | 21.1 | 0.0 | 0.0 | 0.0 | 21.0 | 0.0 | 0.0 | 1.4 | 19.3 | 0.0 | 0.0 | 0.0 | 21.0 | 0.0 |
| 27-Apr-94 | | Terra | 0.0 | 0.0 | 21.0 | 0.0 | 0.0 | 0.0 | 20.9 | 0.0 | 0.0 | 0.0 | 20.9 | 0.0 | 0.0 | 0.0 | 21.0 | 0.0 |
| 03-Jun-94 | | Terra | 54.0 | 45.1 | 0.8 | slight + | 0.0 | 5.1 | 17.4 | 0.0 | 0.0 | 13.1 | 2.5 | 0.0 | 0.0 | 6.0 | 14.1 | slight + |
| 07-Jul-94 | | Terra | 55.0 | 44.5 | 0.3 | 0.0 | 0.0 | 6.0 | 17.0 | 0.0 | 1.2 | 3.3 | 15.4 | 0.0 | 0.0 | 6.9 | 13.4 | 0.0 |
| 02-Aug-94 | | Terra | 53.9 | 45.5 | 0.4 | 0.0 | 0.0 | 5.9 | 14.6 | 0.0 | 0.0 | 0.0 | 22.4 | 0.0 | 0.0 | 0.0 | 22.0 | 0.0 |
| 01-Sep-94 | | Terra | 0.2 | 0.3 | 22.0 | 0.0 | 0.0 | 0.0 | 22.0 | 0.0 | 0.0 | 0.0 | 22.3 | 0.0 | 0.0 | 0.0 | 22.3 | 0.0 |
| 09-Sep-94 | | Terra | 55.5 | 44.1 | 0.4 | 0.0 | 0.0 | 0.0 | 20.5 | 0.0 | 0.0 | 0.0 | 20.4 | 0.0 | 0.0 | 0.0 | 20.5 | 0.0 |
| 15-Sep-94 | | Terra | 54.8 | 44.9 | 0.3 | 0.25 | 0.1 | 6.5 | 13.3 | 0.06 | 0.1 | 1.1 | 18.4 | 0.0 | 0.0 | 4.2 | 14.2 | 0.26 |
| 21-Sep-94 | | Terra | 56.5 | 43.1 | 0.3 | slight + | 0.0 | 7.3 | 12.8 | 0.0 | 0.9 | 2.2 | 16.6 | 0.0 | 0.0 | 2.4 | 16.5 | 0.0 |
| 29-Sep-94 | | Terra | 33.0 | 25.6 | 8.3 | slight + | 0.0 | 7.0 | 13.0 | 0.0 | 0.0 | 0.9 | 19.9 | 0.0 | 0.0 | 1.7 | 18.0 | 0.1 |
| 05-Oct-94 | | Terra | 58.9 | 40.9 | 0.2 | slight + | 0.3 | 6.6 | 14.1 | slight + | 2.1 | 13.0 | 0.4 | 0.0 | 0.0 | 4.9 | 14.8 | 0.08 |
| 11-Oct-94 | | Terra | 57.0 | 43.0 | 0.0 | slight + | 0.0 | 7.7 | 13.7 | 0.0 | 0.0 | 0.5 | 21.0 | 0.0 | 0.0 | 0.0 | 22.6 | 0.0 |
| 20-Oct-94 | | Terra | 57.8 | 42.2 | 0.0 | slight + | 0.0 | 8.7 | 12.6 | 0.0 | 0.0 | 0.0 | 21.9 | 0.0 | 0.0 | 0.0 | 22.5 | 0.0 |
| 26-Oct-94 | | Terra | 58.1 | 41.8 | 0.2 | slight + | 0.0 | 0.0 | 23.2 | 0.0 | 0.4 | 0.7 | 21.6 | 0.0 | 0.0 | 0.0 | 23.3 | 0.0 |
| 02-Nov-94 | | Terra | 58.4 | 40.7 | 0.5 | 0.0 | 0.0 | 0.0 | 23.2 | 0.0 | 0.1 | 0.5 | 22.7 | 0.0 | 0.0 | 5.1 | 16.3 | 0.0 |
| 09-Nov-94 | | Terra | 0.2 | 0.0 | 22.1 | -0.25 | 0.0 | 0.0 | 22.1 | 0.0 | 0.0 | 0.0 | 22.1 | 0.0 | 0.4 | 0.0 | 22.2 | 0.0 |
| 14-Nov-94 | | Terra | 0.1 | 0.0 | 22.5 | 0.05 | 0.1 | 0.0 | 22.3 | 0.0 | 0.0 | 0.0 | 22.3 | 0.0 | 0.2 | 0.0 | 22.7 | 0.0 |
| 21-Nov-94 | | Terra | 0.0 | 0.0 | 22.6 | 0.0 | 0.0 | 0.0 | 22.8 | 0.0 | 0.0 | 0.0 | 22.6 | 0.0 | 0.0 | 0.0 | 22.6 | -0.15 |
| 01-Dec-94 | | Terra | 57.2 | 42.9 | 0.0 | 0.0 | 0.0 | 7.7 | 14.3 | 0.0 | 0.7 | 14.2 | 0.4 | 0.0 | 0.0 | 6.5 | 13.7 | -0.5 |
| 07-Dec-94 | | Terra | 0.0 | 0.0 | 23.4 | 0.05 | 0.0 | 8.2 | 15.4 | 0.0 | 0.0 | 0.3 | 7.7 | 0.0 | 0.0 | 0.0 | 23.0 | 0.0 |
| 13-Dec-94 | 08:00 AM | WDNR | | | | | | | | | | | | | | | | |
| 13-Dec-94 | 11:30 AM | Wenck | 62.0 | | 0.3 | | 1% LEL | | 12.7 | | 1% LEL | | 20.0 | | 1% LEL | | 14.1 | |
| 13-Dec-94 | 11:30 AM | Terra | 61.5 | 37.6 | 1.0 | slight + | 0.0 | 8.0 | 14.2 | 0.0 | 0.1 | 0.2 | 22.7 | 0.0 | 0.0 | 5.4 | 16.3 | 0 |
| 14-Dec-94 | 03:00 PM | Wenck | 58 | | 0.1 | | 1% LEL | | 12.3 | | 1% LEL | | 16.5 | | 1% LEL | | 15.7 | |
| 15-Dec-94 | 10:30 AM | Wenck | 65 | | 0.1 | | 1% LEL | | 12.4 | | 1% LEL | | 18.8 | | 1% LEL | | 14.5 | |
| 16-Dec-94 | 09:00 AM | Wenck | 58.0 | | 0.2 | | 1% LEL | | 13.3 | | 1% LEL | | 3.5 | | 1% LEL | | 15.3 | |
| 16-Dec-94 | 12:00 PM | Wenck | 57.0 | | 0 | | 1% LEL | | 13.3 | | 2% LEL | | 0.6 | | 1% LEL | | 14.0 | |
| 17-Dec-94 | 08:20 AM | Wenck | 58 | | 0.1 | | 1% LEL | | 13.2 | | 1% LEL | | 19.2 | | 1% LEL | | 14.2 | |
| 17-Dec-94 | 12:00 PM | Wenck | 60 | | 0.3 | | 1% LEL | | 20.8 | | 1% LEL | | 20.5 | | 1% LEL | | 20.5 | |
| 19-Dec-94 | 01:30 PM | Wenck | 57 | | 0.1 | | 1% LEL | | 12.5 | | 1% LEL | | 7.1 | | 1% LEL | | 12.6 | |
| 19-Dec-94 | 03:40 PM | Wenck | 57 | | 0.1 | | 1% LEL | | 13.0 | | 2% LEL | | 2.0 | | 1% LEL | | 12.2 | |
| 20-Dec-94 | 09:00 AM | Wenck | 1% LEL | | 20.5 | | 1% LEL | | 20.3 | | 1% LEL | | 20.3 | | 1% LEL | | 20.2 | |
| 21-Dec-94 | 08:00 AM | Wenck | 2% LEL | | 20 | | 1% LEL | | 20.0 | | 1% LEL | | 20.0 | | 1% LEL | | 20.0 | |
| 21-Dec-94 | 02:20 PM | Wenck | 59 | | 0.1 | | 1% LEL | | 20.0 | | 1% LEL | | 12.4 | | 1% LEL | | 20.0 | |
| 22-Dec-94 | 11:20 AM | Wenck | 60 | | 0 | | 1% LEL | | 14.4 | | 1% LEL | | 19.7 | | 1% LEL | | 20 | |
| 23-Dec-94 | 02:43 PM | Wenck | 59 | | 0.2 | | 1% LEL | | 12.9 | | 1% LEL | | 1.7 | | 1% LEL | | 20 | |

Table 2-8a: Gas Monitoring Well Data
Junker Landfill - Hudson Township, Wisconsin

| Date | Time | Sampler | GMW-2B | | | | GMW-3 | | | | MW-4 | | | | GMW-4A | | | |
|-----------|----------|---------|---|---------------------------|------------------|--------------------------|--------------------|---------------------------|------------------|--------------------------|--------------------|---------------------------|------------------|--------------------------|--------------------|---------------------------|------------------|--------------------------|
| | | | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Pressure (inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Pressure (inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Pressure (inches H2O) | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Pressure (inches H2O) |
| 24-Dec-94 | 09:25 AM | Wenck | 61 | | 0.5 | | 1% LEL | | 19.7 | | 1% LEL | | 19.5 | | 1% LEL | | 21 | |
| 26-Dec-94 | 10:40 AM | Wenck | 63 | | 0.3 | | 1% LEL | | 11.8 | | 1% LEL | | 18.9 | | 1% LEL | | 18.5 | |
| 27-Dec-94 | | Terra | | | | | | | | | | | | | | | | |
| 27-Dec-94 | | Terra | 59.5 | 39.4 | 1.1 | slight + | 0.0 | 8.0 | 15.3 | 0.0 | 2.9 | 15.2 | 2.3 | 0.0 | 0.0 | 5.7 | 15.3 | slight + |
| 06-Jan-95 | | Terra | 49.7 | 40.3 | 2.8 | 0.0 | 0.0 | 0.0 | 22.8 | 0.0 | 0.0 | 0.5 | 22.4 | 0.0 | 0.0 | 0.0 | 22.8 | 0.0 |
| 10-Jan-95 | | Terra | 56.7 | 37.1 | 0.9 | 0.0 | 0.0 | 8.2 | 15.8 | 0.0 | 0.0 | 12.3 | 4.6 | 0.0 | 0.0 | 6.7 | 15.1 | 0.0 |
| 18-Jan-95 | | Terra | 0.0 | 0.0 | 22.9 | 0.0 | 0.0 | 0.0 | 23.1 | 0.0 | 0.0 | 1.1 | 22.2 | 0.0 | 0.0 | 0.0 | 22.7 | 0.0 |
| 24-Jan-95 | 12:30 PM | Wenck | 8.0 | 4.3 | 18.2 | | 0.0 | 0.0 | 20.8 | | 1.2 | 0.4 | 19.5 | | 0.0 | 0.0 | 20.4 | |
| 25-Jan-95 | 08:50 AM | Wenck | 12.0 | 7.5 | 16.1 | | 0.0 | 0.0 | 20.8 | | 0.0 | 0.0 | 20.6 | | 0.0 | 0.0 | 20.8 | |
| 26-Jan-95 | 09:20 AM | Wenck | | | | 0.06 | | | | 0.13 | | | | 0.00 | | | | 0.17 |
| 26-Jan-95 | 02:30 PM | Wenck | | | | 0.27 | | | | 0.08 | | | | 0.00 | | | | 0.13 |
| 27-Jan-95 | 02:10 PM | Wenck | 58.5 | 41.5 | 0.0 | 0.07 | | | | | | | | | 0.0 | 0.0 | 20.3 | -0.04 |
| 30-Jan-95 | 09:00 AM | Wenck | 58.7 | 41.1 | 0.1 | 0.16 | | | | | | | | | 0.0 | 3.6 | 15.5 | 0.10 |
| 30-Jan-95 | 04:40 PM | Wenck | 58.9 | 41.5 | 0.0 | 0.81 | | | | | | | | | 0.0 | 6.8 | 11.5 | 0.42 |
| 31-Jan-95 | 09:30 AM | Wenck | 57.4 | 42.4 | 0.2 | 0.06 | | | | | | | | | 0.0 | 6.4 | 12.0 | 0.02 |
| 31-Jan-95 | | Terra | 59.3 | 40.5 | 0.0 | slight + | 0.0 | 6.8 | 14.4 | 0.00 | 0.0 | 6.1 | 12.0 | 0.0 | 0.0 | 7.0 | 11.9 | 0.00 |
| 31-Jan-95 | 01:55 PM | Wenck | 57.4 | 42.5 | 0.4 | 0.16 | 0.0 | 6.9 | 13.8 | | 0.0 | 12.2 | 4.3 | 0.25 | 0.0 | 0.0 | 20.7 | 0.00 |
| 10-Feb-95 | 08:45 AM | Wenck | 0.0 | 0.0 | 20.1 | -0.47 | 0.0 | 0.0 | 19.8 | -0.19 | 0.0 | 0.0 | 20.1 | 0.00 | 0.0 | 0.0 | 19.9 | -0.25 |
| 17-Feb-95 | 11:30 AM | Wenck | 53.9 | 43.5 | 0.0 | 0.11 | 0.0 | 6.1 | 14.0 | 0.06 | 0.0 | 0.0 | 20.9 | 0.01 | 0.0 | 0.0 | 20.5 | 0.11 |
| 23-Feb-95 | 11:40 AM | Wenck | 0.0 | 0.0 | 20.1 | -0.07 | 0.0 | 0.0 | 20.0 | -0.04 | 0.0 | 0.0 | 20.1 | 0.00 | 0.0 | 0.0 | 20.1 | -0.14 |
| 23-Feb-95 | 03:00 AM | Wenck | 0.0 | 0.0 | 20.2 | -0.20 | 0.0 | 0.0 | 20.1 | -0.13 | 0.0 | 0.0 | 20.3 | 0.00 | 0.0 | 0.0 | 20.3 | -0.21 |
| 24-Feb-95 | 09:30 AM | Wenck | 54.7 | 42.1 | 0.0 | 0.13 | 0.0 | 6.3 | 13.5 | 0.06 | 0.0 | 2.8 | 15.5 | 0.00 | 0.0 | 4.6 | 14.1 | 0.04 |
| 24-Feb-95 | 03:20 AM | Wenck | 55.2 | 44.8 | 0.0 | 0.26 | 0.0 | 6.5 | 13.5 | 0.11 | 0.0 | 8.6 | 9.4 | 0.00 | 0.0 | 5.0 | 13.0 | 0.09 |
| 27-Feb-95 | 12:00 PM | Wenck | 54.9 | 42.7 | 0.0 | 0.02 | 0.0 | 6.2 | 13.6 | 0.06 | 0.0 | 0.0 | 20.0 | 0.00 | 0.0 | 4.6 | 13.6 | 0.03 |
| 28-Feb-95 | 02:15 AM | Wenck | 55.8 | 41.0 | 0.0 | 0.12 | 0.0 | 6.8 | 11.4 | 0.06 | 0.0 | 7.1 | 11.3 | 0.00 | 0.0 | 0.0 | 19.7 | -0.01 |
| 01-Mar-95 | 01:40 AM | Wenck | 55.4 | 43.5 | 0.0 | 0.16 | 0.0 | 7.3 | 13.6 | 0.02 | 0.0 | 9.3 | 10.5 | 0.06 | -- | -- | -- | -- |
| 10-Mar-95 | 02:40 AM | Wenck | 56.3 | 40.2 | 0.0 | 0.15 | 0.0 | 6.5 | 14.5 | 0.08 | 0.0 | 8.6 | 9.9 | 0.00 | -- | -- | -- | -- |
| Notes: | | | All measurements in percent volume unless otherwise noted. All Wenck measurements taken by Digi-Flam 2000 in 1994 unless otherwise noted; 1995 measurements taken by Landtec GEM-500. Wenck pressure measurements taken by Neotronics PDM 205. December 20, 1989 through December 2, 1992 data taken from Groundwater and Gas Monitoring Report dated January 1993 by Central Wisconsin Engineers. December 14, 1992 through December 30, 1993 data taken from Long Term Care Quarterly Report to WDNR dated January 20, 1994 by Terra Engineering and Construction Corp. February 10, 1994 through January 31, 1995 Terra data taken from Long Term Care, Summary: January 1995 report to WDNR dated February 10, 1995. | | | | | | | | | | | | | | | |

Table 2-8a: Gas Monitoring Well Data
Junker Landfill - Hudson Township, Wisconsin

| Date | Time | Sampler | GMW-4B | | | | Pressure (Inches H2O) | Comments |
|-----------|------|---------|--------------------|---------------------------|------------------|---------|--------------------------|----------|
| | | | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | | | |
| 20-Dec-89 | | CWE | | | | | | |
| 31-Jan-90 | | CWE | | | | | | |
| 06-Mar-90 | | CWE | | | | | | |
| 22-May-90 | | CWE | | | | | | |
| 06-Jul-90 | | CWE | | | | | | |
| 21-Sep-90 | | CWE | | | | | | |
| 19-Dec-90 | | CWE | | | | | | |
| 25-Sep-91 | | CWE | | | | | | |
| 19-Nov-91 | | CWE | | | | | | |
| 03-Dec-91 | | CWE | | | | | | |
| 10-Dec-91 | | CWE | | | | | | |
| 17-Dec-91 | | CWE | | | | | | |
| 23-Dec-91 | | CWE | | | | | | |
| 30-Dec-91 | | CWE | | | | | | |
| 07-Jan-92 | | CWE | | | | | | |
| 14-Jan-92 | | CWE | | | | | | |
| 21-Jan-92 | | CWE | | | | | | |
| 28-Jan-92 | | CWE | | | | | | |
| 04-Feb-92 | | CWE | | | | | | |
| 10-Feb-92 | | CWE | | | | | | |
| 17-Feb-92 | | CWE | | | | | | |
| 25-Feb-92 | | CWE | 0.0 | | 20.8 | | | |
| 03-Mar-92 | | CWE | 15.0 | | 1.7 | | | |
| 10-Mar-92 | | CWE | 21.0 | | 0.7 | | | |
| 16-Mar-92 | | CWE | 21.0 | | 0.7 | | | |
| 23-Mar-92 | | CWE | 10.0 | | 2.3 | | | |
| 30-Mar-92 | | CWE | 22.0 | | 1.6 | | | |
| 06-Apr-92 | | CWE | 0.0 | | 20.8 | | | |
| 14-Apr-92 | | CWE | 20.0 | | 6.2 | | | |
| 20-Apr-92 | | CWE | 24.0 | | 1.2 | | | |
| 27-Apr-92 | | CWE | 24.0 | | 1.0 | | | |
| 04-May-92 | | CWE | 22.0 | | 7.0 | | | |
| 11-May-92 | | CWE | 24.0 | | 1.5 | | | |
| 18-May-92 | | CWE | 24.0 | | 3.0 | | | |
| 26-May-92 | | CWE | 22.0 | | 1.5 | | | |
| 15-Jun-92 | | CWE | 22.0 | | 2.0 | | | |
| 20-Jul-92 | | CWE | 0.0 | | 20.8 | | | |
| 17-Aug-92 | | CWE | 16.0 | | 3.0 | | | |
| 21-Sep-92 | | CWE | | | | | | |
| 02-Dec-92 | | CWE | | | | | | |
| 14-Dec-92 | | Terra | 7.4 | 19.2 | 0.0 | | | |
| 06-Jan-93 | | Terra | 5.6 | 14.6 | 3.7 | trace + | | |
| 12-Jan-93 | | Terra | | | | | | |
| 18-Jan-93 | | Terra | | | | | | |
| 25-Jan-93 | | Terra | 1.2 | 7.7 | 10.2 | | | |
| 04-Feb-93 | | Terra | 14.5 | 3.8 | 0.2 | | | |
| 11-Feb-93 | | Terra | 0.1 | 6.3 | 11.6 | 0.5 | | |
| 05-Mar-93 | | Terra | 0.0 | 0.7 | 19.3 | | | |
| 02-Apr-93 | | Terra | 0.7 | 13.2 | 0.0 | 0.0 | | |
| 08-Apr-93 | | Terra | 0.4 | 0.0 | 19.6 | 0.0 | | |
| 13-Apr-93 | | Terra | 1.0 | 12.1 | 0.0 | 0.25 | | |
| 23-Apr-93 | | Terra | 0.3 | 6.6 | 12.8 | 0.0 | | |

Table 2-8a: Gas Monitoring Well Data
Junker Landfill - Hudson Township, Wisconsin

| Date | Time | Sampler | GMW-4B | | | | Comments |
|-----------|----------|---------|--------------------|--------------------------|-----------------|--------------------------|--|
| | | | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (inches H2O) | |
| 29-Apr-93 | | Terra | 0.0 | 0.0 | 21.3 | 0.0 | |
| 06-May-93 | | Terra | 0.0 | 0.0 | 21.0 | -0.03 | |
| 12-May-93 | | Terra | 0.0 | 0.0 | 22.3 | 0.0 | |
| 20-May-93 | | Terra | 0.0 | 6.2 | 13.9 | 0.0 | |
| 10-Jun-93 | | Terra | 0.0 | 0.0 | 21.2 | 0.0 | |
| 24-Jun-93 | | Terra | 0.3 | 0.0 | 20.9 | 0.0 | |
| 06-Jul-93 | | Terra | 0.2 | 0.0 | 21.7 | slight - | |
| 20-Jul-93 | | Terra | 0.0 | 0.0 | 22.1 | 0.0 | |
| 03-Aug-93 | | Terra | 0.0 | 0.0 | 21.3 | 0.0 | |
| 16-Aug-93 | | Terra | 0.0 | 6.1 | 13.3 | 0.0 | |
| 30-Sep-93 | | Terra | 0.0 | 6.4 | 0.0 | 0.5 | |
| 02-Nov-93 | | Terra | 0.0 | 6.3 | 12.5 | 0.0 | |
| 01-Dec-93 | | Terra | 0.0 | 6.5 | 11.7 | slight + | |
| 30-Dec-93 | | Terra | 0.0 | 6.2 | 12.2 | 0.0 | |
| 10-Feb-94 | | Terra | 0.0 | 5.5 | 13.9 | 0.0 | |
| 03-Mar-94 | | Terra | 0.0 | 5.6 | 14.2 | 0.0 | |
| 28-Mar-94 | | Terra | 0.0 | 0.0 | 21.0 | 0.0 | |
| 27-Apr-94 | | Terra | 0.0 | 0.0 | 20.9 | 0.0 | |
| 03-Jun-94 | | Terra | 0.0 | 4.0 | 17.0 | slight + | |
| 07-Jul-94 | | Terra | 0.0 | 4.4 | 16.9 | 0.0 | |
| 02-Aug-94 | | Terra | 0.0 | 1.9 | 20.1 | 0.0 | |
| 01-Sep-94 | | Terra | 0.0 | 1.3 | 20.8 | 0.0 | |
| 09-Sep-94 | | Terra | 0.0 | 0.0 | 20.5 | 0.0 | |
| 15-Sep-94 | | Terra | 0.0 | 3.7 | 15.6 | 0.18 | |
| 21-Sep-94 | | Terra | 0.0 | 2.7 | 16.6 | 0.0 | |
| 29-Sep-94 | | Terra | 0.0 | 1.1 | 18.7 | 0.1 | |
| 05-Oct-94 | | Terra | 0.0 | 4.1 | 17.0 | 0.05 | |
| 11-Oct-94 | | Terra | 0.0 | 0.0 | 22.6 | 0.0 | |
| 20-Oct-94 | | Terra | 0.0 | 3.8 | 17.4 | 0.0 | |
| 26-Oct-94 | | Terra | 0.0 | 0.0 | 23.3 | 0.0 | |
| 02-Nov-94 | | Terra | 0.0 | 3.6 | 18.8 | 0.0 | |
| 09-Nov-94 | | Terra | 0.4 | 0.0 | 22.3 | 0.0 | |
| 14-Nov-94 | | Terra | 0.1 | 0.0 | 22.5 | 0.1 | |
| 21-Nov-94 | | Terra | 0.0 | 0.0 | 22.5 | 0.0 | |
| 01-Dec-94 | | Terra | 0.0 | 4.2 | 17.5 | 0.0 | |
| 07-Dec-94 | | Terra | 0.0 | 0.0 | 23.1 | 0.0 | |
| 13-Dec-94 | 08:00 AM | WDNR | | | | | Gas extraction system off for RI pump test |
| 13-Dec-94 | 11:30 AM | Wenck | 1% LEL | | 16.7 | | |
| 13-Dec-94 | 11:30 AM | Terra | 0.0 | 4.1 | 18.3 | | 0 Landtec gas meter |
| 14-Dec-94 | 03:00 PM | Wenck | 1% LEL | | 20.0 | | |
| 15-Dec-94 | 10:30 AM | Wenck | 1% LEL | | 16.0 | | |
| 16-Dec-94 | 09:00 AM | Wenck | 1% LEL | | 15.8 | | Max. CH of 41% LEL @ MW-7 |
| 16-Dec-94 | 12:00 PM | Wenck | 1% LEL | | 15.8 | | |
| 17-Dec-94 | 08:20 AM | Wenck | 1% LEL | | 16.2 | | |
| 17-Dec-94 | 12:00 PM | Wenck | 1% LEL | | 20.5 | | |
| 19-Dec-94 | 01:30 PM | Wenck | 1% LEL | | 15.5 | | Successive rise and fall CH @ MW-7 |
| 19-Dec-94 | 03:40 PM | Wenck | 1% LEL | | 16.5 | | |
| 20-Dec-94 | 09:00 AM | Wenck | 1% LEL | | 20.3 | | |
| 21-Dec-94 | 08:00 AM | Wenck | 1% LEL | | 20.0 | | |
| 21-Dec-94 | 02:20 PM | Wenck | 1% LEL | | 20.0 | | |
| 22-Dec-94 | 11:20 AM | Wenck | 1% LEL | | 20 | | |
| 23-Dec-94 | 02:43 PM | Wenck | 1% LEL | | 20 | | |

Table 2-8a: Gas Monitoring Well Data
Junker Landfill - Hudson Township, Wisconsin

| | | | GMW-4B | | | | |
|-----------|----------|---------|--------------------|--------------------------|-----------------|--------------------------|---|
| Date | Time | Sampler | Methane CH4 (%) | Carbon Dioxide CO2(%) | Oxygen O2(%) | Pressure (Inches H2O) | Comments |
| 24-Dec-94 | 09:25 AM | Wenck | 1% LEL | | 20 | | Gas extraction system on after RI pump test |
| 26-Dec-94 | 10:40 AM | Wenck | 1% LEL | | 17.3 | | |
| 27-Dec-94 | | Terra | | | | | |
| 27-Dec-94 | | Terra | 0.0 | 2.7 | 17.8 | slight + | |
| 06-Jan-95 | | Terra | 0.0 | 0.0 | 22.6 | 0.0 | MW-4, GMW-4A4B monitored @ 2:45pm |
| 10-Jan-95 | | Terra | 0.0 | 4.6 | 18.1 | 0.0 | |
| 18-Jan-95 | | Terra | 0.0 | 0.0 | 22.7 | 0.0 | |
| 24-Jan-95 | 12:30 PM | Wenck | 0.0 | 0.0 | 20.4 | | |
| 25-Jan-95 | 08:50 AM | Wenck | 0.0 | 0.0 | 20.8 | | |
| 26-Jan-95 | 09:20 AM | Wenck | | | | 0.12 | |
| 26-Jan-95 | 02:30 PM | Wenck | | | | 0.09 | |
| 27-Jan-95 | 02:10 PM | Wenck | 0.0 | 0.0 | 20.3 | -0.04 | |
| 30-Jan-95 | 09:00 AM | Wenck | 0.0 | 3.7 | 15.8 | 0.05 | |
| 30-Jan-95 | 04:40 PM | Wenck | 0.0 | 3.8 | 15.6 | 0.29 | |
| 31-Jan-95 | 09:30 AM | Wenck | 0.0 | 3.6 | 15.9 | 0.02 | |
| 31-Jan-95 | | Terra | 0.0 | 2.8 | 17.1 | 0.00 | |
| 31-Jan-95 | 01:55 PM | Wenck | 0.0 | 3.8 | 15.5 | 0.00 | |
| 10-Feb-95 | 08:45 AM | Wenck | 0.0 | 0.0 | 19.8 | -0.20 | |
| 17-Feb-95 | 11:30 AM | Wenck | 0.0 | 3.3 | 15.8 | 0.07 | |
| 23-Feb-95 | 11:40 AM | Wenck | 0.0 | 0.0 | 20.0 | -0.09 | |
| 23-Feb-95 | 03:00 AM | Wenck | 0.0 | 0.0 | 20.3 | -0.13 | |
| 24-Feb-95 | 09:30 AM | Wenck | 0.0 | 3.0 | 16.2 | 0.03 | |
| 24-Feb-95 | 03:20 AM | Wenck | 0.0 | 3.3 | 15.5 | 0.14 | |
| 27-Feb-95 | 12:00 PM | Wenck | 0.0 | 3.1 | 15.8 | 0.03 | |
| 28-Feb-95 | 02:15 AM | Wenck | 0.0 | 0.0 | 19.7 | -0.01 | |
| 01-Mar-95 | 01:40 AM | Wenck | -- | -- | -- | -- | |
| 10-Mar-95 | 02:40 AM | Wenck | -- | -- | -- | -- | |
| Notes: | | | | | | | |

Table 2-8b: Geoprobe Gas Monitoring Data
Junker Landfill - Hudson Township, Wisconsin

| Location | Date | Time | Depth (ft) | Elev. (ft ngvd) | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Comments |
|---|-----------|----------|---------------|--------------------|--------------------|---------------------------|------------------|--------------------------------------|
| GP1 Alex (Gnd. elev. 1012.0) | 25-Jan-95 | 01:00 PM | 20 | 992.0 | 0.0 | 4.8 | 9.0 | |
| | | | 36 | 976.0 | 0.0 | 2.1 | 16.7 | |
| | | | 52 | 960.0 | 1.2 | 8.8 | 2.0 | |
| GP2 Alex NW (Gnd. elev. 1013.5) | 24-Jan-95 | 02:10 PM | 19 | 994.5 | 0.0 | 7.3 | 14.5 | CH < 0.01% (GC) |
| | | | 36 | 977.5 | 0.0 | 12.3 | 9.0 | CH < 0.01% (GC) |
| | | | 52 | 961.5 | 0.0 | 12.3 | 3.5 | CH < 0.01% (GC) |
| | 25-Jan-95 | 08:18 AM | 53 | 960.5 | 0.0 | 10.5 | 4.0 | Open to atmosphere overnight |
| GP2RR (Gnd. elev. 1000.4) | 30-Jan-95 | 02:45 PM | 12 | 988.4 | 0.0 | 1.0 | 19.8 | |
| | | | 20 | 980.4 | 0.0 | 1.8 | 19.0 | |
| | | | 30 | 970.4 | 0.0 | 4.3 | 15.3 | |
| | | | 40 | 960.4 | 0.0 | 4.4 | 15.3 | |
| GP4 Alex (Gnd. elev. 1013.0) | 24-Jan-95 | 08:55 AM | 20 | 993.0 | 0.5 | 19.0 | 4.8 | CH = 1.3% (GC) |
| | | | 36 | 977.0 | 23.3 | 22.0 | 5.9 | CH = 30% (GC) |
| | | | 52 | 961.0 | 68.3 | 31.7 | 0.1 | CH = 80% (GC) |
| GP4RR (Gnd. elev. 1002.2) | 30-Jan-95 | 09:45 AM | 12 | 990.2 | 0.0 | 4.1 | 16.6 | |
| | | | 20 | 982.2 | 2.5 | 5.8 | 12.1 | |
| | 31-Jan-95 | 11:20 AM | 30 | 972.2 | 34.3 | 30.9 | 0.0 | |
| | | | 40 | 962.2 | 7.2 | 5.8 | 16.4 | |
| | | | 50 | 952.2 | 12.3 | 28.0 | 0.2 | |
| | | | 60 | 942.2 | 12.1 | 27.9 | 0.10 | Sample via steel rod, evac. 4L prior |
| GP6 RR (Gnd. elev. 1003.5) | 27-Jan-95 | 12:00 PM | 20 | 983.5 | 23.3 | 24.8 | 0.0 | |
| | | | 40 | 963.5 | 0.0 | 14.0 | 7.3 | |
| | | | 50 | 953.5 | 0.0 | 9.3 | 9.8 | |
| GP6 RR Well Pt. (Gnd. elev. 1003.5) | 27-Jan-95 | 03:30 PM | 20 | 983.5 | 19.5 | 21.0 | 3.2 | ~ 2L purge prior to sample |
| | 30-Jan-95 | 08:50 AM | 20 | 983.5 | 23.3 | 25.8 | 0.0 | |
| | 30-Jan-95 | 04:40 PM | 20 | 983.5 | 23.0 | 25.7 | 0.1 | |
| | 31-Jan-95 | 09:30 AM | 20 | 983.5 | 22.8 | 25.0 | 0.8 | |
| | 31-Jan-95 | 01:55 PM | 20 | 983.5 | 24.1 | 26.1 | 0.4 | |
| GP7 Alex (Gnd. elev. 1013.1) | 25-Jan-95 | 09:25 AM | 20 | 993.1 | 0.0 | 8.3 | 13.1 | |
| | | | 36 | 977.1 | 8.0 | 19.2 | 2.4 | |
| | | | 52 | 961.1 | 6.4 | 17.9 | 2.9 | |
| GP8 RR (Gnd. elev. 1004.7) | 27-Jan-95 | 09:40 AM | 20 | 984.7 | 0.0 | 2.7 | 17.2 | |
| | | | 40 | 964.7 | 0.0 | 6.1 | 13.3 | |
| | | | 50 | 954.7 | 0.0 | 7.9 | 11.3 | |
| GP1 RES (Gnd. elev. 1022.3) | 23-Feb-95 | 03:00 PM | 35 | 987.3 | 0.0 | 3.4 | 14.9 | |
| | | | 45 | 977.3 | 0.0 | 3.3 | 14.9 | |

Table 2-8b: Geoprobe Gas Monitoring Data
Junker Landfill - Hudson Township, Wisconsin

| Location | Date | Time | Depth (ft) | Elev. (ft ngvd) | Methane CH4 (%) | Carbon Dioxide CO2 (%) | Oxygen O2 (%) | Comments |
|--|-----------|----------|------------|-----------------|-----------------|------------------------|---------------|--|
| GP2 RES (Gnd. elev. 1016.7) | 23-Feb-95 | 01:10 PM | 20 | 996.7 | 0.0 | 3.2 | 16.2 | |
| | 24-Feb-95 | 12:30 PM | 30 | 986.7 | 0.0 | 3.1 | 16.4 | |
| | | | 32 | 984.7 | 0.0 | 3.1 | 16.3 | |
| | | | 35 | 981.7 | 0.0 | 3.1 | 16.3 | |
| | 23-Feb-95 | 01:10 PM | 40 | 976.7 | 0.0 | 4.9 | 12.8 | |
| | | | 60 | 956.7 | 0.0 | 2.6 | 13.6 | |
| GP3 Res (Gnd. elev. 1033.8) | 23-Feb-95 | 10:00 AM | 20 | 1013.8 | 0.0 | 5.1 | 13.2 | |
| | | | 40 | 993.8 | 0.0 | 8.1 | 9.3 | |
| | | 04:30 PM | 50 | 983.8 | 0.0 | 0.0 | 20.1 | Very tight formation, couldn't pull vac. |
| | | | 55 | 978.8 | 5.0 | 7.8 | 6.9 | |
| | | 10:00 AM | 60 | 973.8 | 2.7 | 4.6 | 12.3 | |
| | | | 70 | 963.8 | 0.4 | 0.8 | 18.4 | Sample via steel rod, evac. 7L prior |
| GP3 Res Well Pt (Gnd. elev. 1033.8) | 24-Feb-95 | 03:20 PM | 55 | 978.8 | 5.4 | 11.7 | 3.0 | |
| | 27-Feb-95 | 12:00 PM | 55 | 978.8 | 2.9 | 10.5 | 3.9 | |
| | 28-Feb-95 | 02:15 PM | 55 | 978.8 | 0.7 | 10.9 | 5.1 | |
| | 01-Mar-95 | 01:40 PM | 55 | 978.8 | 4.7 | 12.9 | 1.8 | |
| | 10-Mar-95 | 02:40 PM | 55 | 978.8 | 5.7 | 12.6 | 0.0 | |
| | | | | | | | | |
| GP4 Res (Gnd. elev. 1025.6) | 23-Feb-95 | 08:05 AM | 20 | 1005.6 | 0.0 | 4.8 | 15.0 | |
| | | | 40 | 985.6 | 0.0 | 0.0 | 19.9 | |
| | | | 60 | 965.6 | 0.0 | 0.0 | 19.7 | |
| GP4 Res Well Pt (Gnd. elev. 1025.6) | 24-Feb-95 | 03:20 PM | 47 | 978.6 | 0.0 | 13.1 | 0.3 | |
| | 27-Feb-95 | 12:00 PM | 47 | 978.6 | 0.0 | 10.7 | 2.3 | |
| | 28-Feb-95 | 02:15 PM | 47 | 978.6 | 0.0 | 11.9 | 6.8 | |
| | 01-Mar-95 | 01:40 PM | 47 | 978.6 | 0.0 | 11.5 | 3.8 | |
| | 10-Mar-95 | 02:40 PM | 47 | 978.6 | -- | -- | -- | No odor; pressure shut Landtec off |
| | | | | | | | | |
| GP5 Res (Gnd. elev. 1014.2) | 24-Feb-95 | 02:30 PM | 25 | 989.2 | 0.0 | 2.9 | 16.6 | |
| | | | 35 | 979.2 | 0.0 | 3.0 | 16.4 | |
| | | | 50 | 964.2 | 0.0 | 3.7 | 15.2 | Sample via steel rod, evac. 7L prior |
| WW-13 (T.O.C. elev. 1011.85) | 24-Feb-95 | 04:30 PM | 125 | 907.8 | 0.0 | 10.0 | 6.2 | Sample and elev. are top of screen |

Note:

- 1) A minimum of 2L of air was evacuated from 0.17" ID sampling hose prior to each depth sample. Samples taken via steel rod were ones in which the sampling hose connection could not be made; therefore, the top was stoppered and a greater amount of air was purged prior to taking the sample via tubing inserted through the rubber stopper.
- 2) Samples analyzed by Landtec GEM-500. Samples taken January 24, 1995 analyzed by Matrix gas chromatograph (GC) for methane.
- 3) No air was evacuated from well WW-13 prior to sampling.

Table 2-10: Groundwater Elevations

Junker Landfill - Hudson Township, Wisconsin

| Well | Date | Top of Inner Casing (ft ngvd) | Depth to Groundwater (ft) | Groundwater Elevation (ft ngvd) |
|----------|-----------|----------------------------------|------------------------------|------------------------------------|
| MW-3 | 13-Jan-95 | 986.92 | 88.98 | 897.94 +.38 |
| MW-3 | 08-Feb-95 | 986.92 | 89.12 | 897.80 |
| MW-3 | 13-Feb-95 | 986.92 | 89.40 | 897.52 |
| MW-3 | 09-Mar-95 | 986.92 | 89.36 | 897.56 |
| MW-4 | 13-Jan-95 | 1017.64 | 118.34 | 899.30 +.34 |
| MW-4 | 01-Feb-95 | 1017.64 | 118.44 | 899.20 |
| MW-4 | 13-Feb-95 | 1017.64 | 118.63 | 899.01 |
| MW-4 | 09-Mar-95 | 1017.64 | 118.68 | 898.96 |
| MW-5 | 13-Jan-95 | 1002.62 | 103.07 | 899.55 +.33 |
| MW-5 | 08-Feb-95 | 1002.62 | 103.18 | 899.44 |
| MW-5 | 13-Feb-95 | 1002.62 | 103.31 | 899.31 |
| MW-5 | 09-Mar-95 | 1002.62 | 103.40 | 899.22 |
| MW-6 | 13-Jan-95 | 1009.66 | 110.62 | 899.04 +.38 |
| MW-6 | 31-Jan-95 | 1009.66 | 110.65 | 899.01 |
| MW-6 | 13-Feb-95 | 1009.66 | 110.97 | 898.69 |
| MW-6 | 09-Mar-95 | 1009.66 | 111.00 | 898.66 |
| MW-7 | 13-Jan-95 | 1013.01 | 112.07 | 900.94 +.28 |
| MW-7 | 01-Feb-95 | 1013.01 | 112.12 | 900.89 |
| MW-7 | 13-Feb-95 | 1013.01 | 112.37 | 900.64 |
| MW-7 | 09-Mar-95 | 1013.01 | 112.35 | 900.66 |
| MW-8 | 13-Jan-95 | 1003.34 | 103.47 | 899.87 +.36 |
| MW-8 | 31-Jan-95 | 1003.34 | 103.54 | 899.80 |
| MW-8 | 13-Feb-95 | 1003.34 | 103.38 | 899.96 |
| MW-8 | 09-Mar-95 | 1003.34 | 103.83 | 899.51 |
| MW-9 | 13-Jan-95 | 1006.57 | 106.86 | 899.71 +.25 |
| MW-9 | 13-Feb-95 | 1006.57 | 106.76 | 899.81 |
| MW-9 | 09-Mar-95 | 1006.57 | 107.22 | 899.35 |
| MW-10 | 13-Jan-95 | 1006.18 | 107.00 | 899.18 |
| MW-10 | 31-Jan-95 | 1006.18 | 107.00 | 899.18 |
| MW-10 | 13-Feb-95 | 1006.18 | 107.13 | 899.05 |
| MW-10 | 09-Mar-95 | 1006.18 | 107.34 | 898.84 |
| WW-11 | 13-Feb-95 | 1034.16 | 131.80 | 902.36 |
| WW-11 | 09-Mar-95 | 1034.16 | 131.67 | 902.49 |
| WW-12 | 31-Jan-95 | 1065.54 | 156.66 | 908.88 |
| WW-12 | 13-Feb-95 | 1065.54 | 157.40 | 908.14 |
| WW-12 | 09-Mar-95 | 1065.54 | 157.32 | 908.22 |
| WW-13 | 09-Feb-95 | 1011.85 | 111.32 | 900.53 |
| WW-13 | 13-Feb-95 | 1011.85 | 111.50 | 900.35 |
| WW-13 | 09-Mar-95 | 1011.85 | 111.57 | 900.28 |
| WW-14 | 09-Feb-95 | 970.75 | 72.34 | 898.41 |
| WW-14 | 13-Feb-95 | 970.75 | 72.38 | 898.37 |
| WW-14 | 09-Mar-95 | 970.75 | 72.61 | 898.14 |
| WW-15A | 07-Feb-95 | 924.29 | 70.01 | 854.28 |
| WW-15A | 13-Feb-95 | 924.29 | 70.17 | 854.12 |
| WW-15A | 09-Mar-95 | 924.29 | 70.26 | 854.03 |
| WW-15B | 07-Feb-95 | 924.52 | 70.29 | 854.23 |
| WW-15B | 13-Feb-95 | 924.52 | 70.38 | 854.14 |
| WW-15B | 09-Mar-95 | 924.52 | 70.52 | 854.00 |
| WW-15C | 07-Feb-95 | 924.26 | 69.98 | 854.28 |
| WW-15C | 13-Feb-95 | 924.26 | 70.06 | 854.20 |
| WW-15C | 09-Mar-95 | 924.26 | 70.24 | 854.02 |
| WW-16 | 09-Mar-95 | 915.13 | 59.52 | 855.61 |
| NL MW-11 | 13-Jan-95 | 867.95 | 19.06 | 848.89 +.49 |
| NL MW-11 | 06-Feb-95 | 867.95 | 19.22 | 848.73 |
| NL MW-11 | 13-Feb-95 | 867.95 | 19.35 | 848.60 |
| NL MW-11 | 09-Mar-95 | 867.95 | 19.55 | 848.40 |

Table 2-10: Groundwater Elevations
Junker Landfill - Hudson Township, Wisconsin

| Well | Date | Top of Inner Casing (ft ngvd) | Depth to Groundwater (ft) | Groundwater Elevation (ft ngvd) |
|---------------|-----------|----------------------------------|------------------------------|------------------------------------|
| NL MW-12 | 13-Jan-95 | 871.85 | 25.49 | 846.36 |
| NL MW-12 | 02-Feb-95 | 871.85 | 25.70 | 846.15 |
| NL MW-12 | 13-Feb-95 | 871.85 | 25.82 | 846.03 |
| NL MW-12 | 09-Mar-95 | 871.85 | 25.96 | 845.89 |
| NL MW-13 | 13-Jan-95 | 899.30 | 48.77 | 850.53 |
| NL MW-13 | 06-Feb-95 | 899.30 | 48.90 | 850.40 |
| NL MW-13 | 13-Feb-95 | 899.30 | 49.10 | 850.20 |
| NL MW-13 | 09-Mar-95 | 899.30 | 49.22 | 850.08 |
| MW-50S | 13-Jan-95 | 918.80 | 56.40 | 862.40 |
| MW-50S | 01-Feb-95 | 918.80 | 56.76 | 862.04 |
| MW-50S | 13-Feb-95 | 918.80 | 57.27 | 861.53 |
| MW-50S | 09-Mar-95 | 918.80 | 59.21 | 859.59 |
| MW-50D | 13-Jan-95 | 918.65 | 75.36 | 843.29 |
| MW-50D | 01-Feb-95 | 918.65 | 75.60 | 843.05 |
| MW-50D | 13-Feb-95 | 918.65 | 75.86 | 842.79 |
| MW-50D | 09-Mar-95 | 918.65 | 75.95 | 842.70 |
| 963 LaBarge | 13-Jan-95 | 930.10 | 68.28 | 861.82 |
| 786 McCutcher | 13-Jan-95 | 914.40 | 46.95 | 867.45 |
| Tjadin Prop. | 13-Jan-95 | 1069.50 | 175.20 | 894.30 |

Note: MW-50S & MW-50D are WDNR monitoring wells
 "NL" = Nor Lake facility monitoring wells

*draw a gw
 map using January 13, 1995
 ac*

Table 3-1: Screened Formations in Area Wells
Junker Landfill - Hudson Township, Wisconsin

| Glacial Formation | | Prairie du Chien | | Prairie du Chien | | Jordan Sandstone | |
|-------------------|--------------------------|------------------|--------------------------|------------------|--------------------------|------------------|--------------------------|
| Well | Well Depth (feet bgl) | Well I.D. | Well Depth (feet bgl) | Well I.D. | Well Depth (feet bgl) | Well | Well Depth (feet bgl) |
| NL MW-11 | 35 | MW-50S | 63 | 993* | 75 | 812 | 350 |
| NL MW-12 | 38 | WW-15A | 76 | 775* | 100 | 771 | 350 |
| NL MW-13 | 60 | 1001 | 87 | 917* | 115 | 779 | 357 |
| WW-16 | 70 | WW-14 | 92 | 961* | 115 | 948 | 358 |
| 953 | 108 | 794 | 105 | 795* | 120 | 766 | 359 |
| 959 | 125 | 954 | 105 | 942* | 144 | 772 | 360 |
| 932 | 141 | 718 | 113 | 985* | 150-220 est. | 892E | 445 |
| | | 915 | 115 | 887* | 180 | | |
| | | 923 | 115 | 757* | 180 | | |
| | | 795 | 115 | 696* | 200 | | |
| | | MW-50D | 119 | 898E* | 220 | | |
| | | 677 | 119 | 792* | 250 | | |
| | | 997 | 120 | 848* | 285 | | |
| | | MW-9 | 121 | | | | |
| | | 767 | 123 | | | | |
| | | 965 | 123 | | | | |
| | | WW-13 | 125 | | | | |
| | | 891 | 126 | | | | |
| | | 712 | 127 | | | | |
| | | 671 | 128 | | | | |
| | | 764 | 134 | | | | |
| | | 787 | 135 | | | | |
| | | 783H | 135 | | | | |
| | | 981 | 137 | | | | |
| | | MW-10 | 141 | | | | |
| | | 928 | 141 | | | | |
| | | 666E | 147 | | | | |
| | | 720 | 147 | | | | |
| | | 763 | 147 | | | | |
| | | WW-15B | 151 | | | | |
| | | WW-11 | 155 | | | | |
| | | 980 | 160 | | | | |
| | | 1026 | 165 | | | | |
| | | MW-8 | 166 | | | | |
| | | 880 | 166 | | | | |
| | | 888E | 172 | | | | |
| | | 704 | 173 | | | | |
| | | WW-12 | 175 | | | | |
| | | MW-5 | 185 | | | | |
| | | 890E | 185 | | | | |
| | | WW-15C | 200 | | | | |
| | | Troop House | 204 | | | | |
| | | MW-7 | 204 | | | | |
| | | 884 | 205 | | | | |
| | | MW-4 | 217 | | | | |
| | | 935 | 230 | | | | |
| | | 931E | 230 | | | | |
| | | 881 | 232 | | | | |
| | | MW-6 | 236 | | | | |
| | | 920 | 240 | | | | |
| | | 881E | 250 | | | | |
| | | Lot 62 | 250 | | | | |
| | | 963 | 256 | | | | |
| | | 888 | 260 | | | | |
| | | Tjadin | 260 | | | | |

Notes: E = U.S. Highway 12 East

"NL" = Nor Lake Monitoring Well

* = Inferred geologic completion zone from homeowner information

Table 4-1: Metals in Groundwater and Leachate (1995 Metal Concentrations)
Junker Landfill - Hudson Township, Wisconsin

| Client ID | Date Sampled | Total Silver | Dissolved Silver | Total Aluminum | Dissolved Aluminum | Total Arsenic | Dissolved Arsenic | Total Barium | Dissolved Barium | Total Beryllium | Dissolved Beryllium | Total Calcium | Dissolved Calcium | Total Cadmium | Dissolved Cadmium | Total Cobalt | Dissolved Cobalt |
|-------------------|--------------|--------------|------------------|----------------|--------------------|---------------|-------------------|--------------|------------------|-----------------|---------------------|---------------|-------------------|---------------|-------------------|--------------|------------------|
| WDNR ES | | 50 | | | | 50 | | 2000 | | | | | | 5 | | | |
| WDNR PAL | | 10 | | | | 5 | | 400 | | | | | | 0.5 | | | |
| Leachate : | | | | | | | | | | | | | | | | | |
| GEW-7 | 21-Dec-94 | <6.9 | | * 98.5 | | 43.5 | | 335 | | <0.40 | | 87900 | | <3.0 | | * 47.7 | |
| GEW-7 | 09-Feb-95 | <7.0 | | <44.6 | | 25.8 | | 472 | | <0.24 | | 91600 | | <2.7 | | 46.3 | |
| GEW-8 | 09-Feb-95 | <7.0 | | * 65.4 | | 20.7 | | 282 | | <0.24 | | 73200 | | <2.7 | | * 28.9 | |
| GEW-9 | 21-Dec-94 | <6.9 | | * 87.6 | | 15.5 | | 347 | | * 0.48 | | 91400 | | <3.0 | | * 36.7 | |
| GEW-9 | 09-Feb-95 | <7.0 | | * 73.1 | | 16.3 | | 385 | | <0.24 | | 129000 | | <2.7 | | * 31.0 | |
| GEW-10 | 09-Feb-95 | <7.0 | | * 65.9 | | 32.5 | | 381 | | <0.24 | | 47000 | | <2.7 | | 47.6 | |
| LHW-1 | 09-Feb-95 | <7.0 | | 441 | | 134 | | 453 | | <0.24 | | 90400 | | <2.7 | | 47.6 | |
| Blanks : | | | | | | | | | | | | | | | | | |
| MW-302 | 07-Feb-95 | | <7.0 | | <44.6 | | <1.0 | | <0.96 | | <0.24 | | <8.2 | | <2.7 | | <4.3 |
| MW-303 | 09-Feb-95 | | <7.0 | | <44.6 | | <1.0 | | <0.96 | | <0.24 | | <8.2 | | <2.7 | | <4.3 |
| MW-304 | 07-Mar-95 | | <7.0 | | <44.6 | | <1.0 | | * 1.2 | | <0.24 | | * 102 | | <2.7 | | <4.3 |
| MW-9MS | 09-Mar-95 | | <6.96 | | <44.6 | | <1.0 | | * 24.9 | | <0.24 | | 57187 | | <2.72 | | <4.32 |
| MW-9MS dup | 09-Mar-95 | | 38.3 | | 1633 | | 36.4 | | 1568 | | 41.2 | | 56129 | | 41.0 | | 391 |

Concentrations in ug/L

* : Estimated Concentration

Table 4-1: Metals in Groundwater and Leachate (1995 Metal Concentrations)
Junker Landfill - Hudson Township, Wisconsin

| Client ID | Date Sampled | Total Silver | Dissolved Silver | Total Aluminum | Dissolved Aluminum | Total Arsenic | Dissolved Arsenic | Total Barium | Dissolved Barium | Total Beryllium | Dissolved Beryllium | Total Calcium | Dissolved Calcium | Total Cadmium | Dissolved Cadmium | Total Cobalt | Dissolved Cobalt |
|--------------------|--------------|--------------|------------------|----------------|--------------------|---------------|-------------------|--------------|------------------|-----------------|---------------------|---------------|-------------------|---------------|-------------------|--------------|------------------|
| WDNR ES | | 50 | | | | 50 | | 2000 | | | | | | 5 | | | |
| WDNR PAL | | 10 | | | | 5 | | 400 | | | | | | 0.5 | | | |
| Groundwater : | | | | | | | | | | | | | | | | | |
| MW-3 | 08-Feb-95 | | <7.0 | | <44.6 | | <1.0 | | * 22.8 | | <0.24 | | 78400 | | <2.7 | | <4.3 |
| MW-3 | 08-Feb-95 | <7.0 | | <44.6 | | <1.0 | | * 23.4 | | <0.24 | | 77700 | | <2.7 | | <4.3 | |
| MW-3 | 06-Mar-95 | | <7.0 | | <44.6 | | <1.0 | | * 27.0 | | <0.24 | | 78700 | | <2.7 | | <4.3 |
| MW-3 | 06-Mar-95 | <7.0 | | <44.6 | | <1.0 | | * 28.1 | | <0.24 | | 78300 | | <2.7 | | <4.3 | |
| MW-5 | 08-Feb-95 | | <7.0 | | <44.6 | | <1.0 | | * 19.8 | | <0.24 | | 57600 | | <2.7 | | <4.3 |
| MW-5 | 09-Mar-95 | | <7.0 | | <44.6 | | <1.0 | | * 23.7 | | <0.24 | | 59700 | | <2.7 | | <4.3 |
| MW-9 | 13-Feb-95 | | <7.0 | | <44.6 | | <1.0 | | * 23.6 | | <0.24 | | 59200 | | <2.7 | | <4.3 |
| MW-9 | 09-Mar-95 | | <7.0 | | <44.6 | | * 1.0 | | * 25.1 | | <0.24 | | 56100 | | <2.7 | | <4.3 |
| WW-11 | 21-Feb-95 | | <7.0 | | <44.6 | | <1.0 | | * 23.4 | | <0.24 | | 38900 | | <2.7 | | <4.3 |
| WW-11 | 21-Feb-95 | <7.0 | | <44.6 | | * 1.5 | | * 11.6 | | <0.24 | | 48100 | | <2.7 | | <4.3 | |
| WW-11 | 09-Mar-95 | | <7.0 | | * 141 | | <1.0 | | * 20.6 | | <0.24 | | 47900 | | <2.7 | | <4.3 |
| WW-11 | 09-Mar-95 | <7.0 | | 2400 | | * 1.6 | | * 33.3 | | <0.24 | | 67100 | | <2.7 | | <4.3 | |
| WW-13 | 09-Feb-95 | | <7.0 | | <44.6 | | <1.0 | | * 79.0 | | <0.24 | | 83400 | | <2.7 | | <4.3 |
| WW-13 | 09-Feb-95 | <7.0 | | 512 | | <1.0 | | * 86.7 | | <0.24 | | 89000 | | <2.7 | | <4.3 | |
| WW-13 dup | 09-Feb-95 | | <7.0 | | <44.6 | | <1.0 | | * 88.6 | | <0.24 | | 86800 | | <2.7 | | <4.3 |
| WW-13 dup | 09-Feb-95 | <7.0 | | 237 | | <1.0 | | * 85.4 | | <0.24 | | 89500 | | <2.7 | | <4.3 | |
| WW-13 | 09-Mar-95 | | <7.0 | | <44.6 | | <1.0 | | * 91.5 | | <0.24 | | 93800 | | <2.7 | | <4.3 |
| WW-13 | 09-Mar-95 | <7.0 | | 3940 | | * 1.1 | | * 107 | | <0.24 | | 102000 | | <2.7 | | <4.3 | |
| WW-13 dup | 09-Mar-95 | | <7.0 | | <44.6 | | <1.0 | | * 91.3 | | <0.24 | | 92000 | | <2.7 | | <4.3 |
| WW-13 dup | 09-Mar-95 | <7.0 | | 4320 | | <1.0 | | * 107 | | <0.24 | | 99700 | | <2.7 | | <4.3 | |
| WW15A | 07-Feb-95 | | <7.0 | | <44.6 | | <1.0 | | * 23.1 | | <0.24 | | 31300 | | <2.7 | | <4.3 |
| WW15A | 07-Mar-95 | | <7.0 | | <44.6 | | * 1.1 | | * 27.3 | | <0.24 | | 28200 | | <2.7 | | <4.3 |
| 786 McCutcheon | 16-Feb-95 | <7.0 | | <44.6 | | <1.0 | | * 8.1 | | <0.24 | | 52500 | | <2.7 | | <4.3 | |
| 786 McCutcheon dup | 16-Feb-95 | <7.0 | | <44.6 | | <1.0 | | * 9.0 | | <0.24 | | 51900 | | <2.7 | | <4.3 | |
| 786 McCutcheon | 01-Mar-95 | <7.0 | | * 46.0 | | <1.0 | | * 6.8 | | <0.24 | | 39800 | | <2.7 | | <4.3 | |
| 786 McCutcheon dup | 01-Mar-95 | <7.0 | | <44.6 | | <1.0 | | * 6.2 | | <0.24 | | 39500 | | <2.7 | | <4.3 | |
| 963 LaBarge | 06-Feb-95 | <7.0 | | <44.6 | | <1.0 | | * 13.4 | | <0.24 | | 69000 | | <2.7 | | <4.3 | |
| 963 LaBarge | 02-Mar-95 | <7.0 | | 710 | | <1.0 | | * 16.7 | | <0.24 | | 53000 | | <2.7 | | <4.3 | |
| 980 Cty. Rd. A. | 06-Feb-95 | <7.0 | | <44.6 | | <1.0 | | * 9.2 | | <0.24 | | 52600 | | <2.7 | | <4.3 | |
| 980 Cty. Rd. A. | 06-Mar-95 | <7.0 | | <44.6 | | <1.0 | | * 15.0 | | <0.24 | | 69700 | | <2.7 | | <4.3 | |

Table 4-1: Metals in Groundwater and Leachate (1995 Concentrations)
Junker Landfill - Hudson Township, Wisconsin

| Client ID | Date Sampled | Total Chromium | Dissolved Chromium | Total Copper | Dissolved Copper | Total Iron | Dissolved Iron | Total Mercury | Dissolved Mercury | Total Potassium | Dissolved Potassium | Total Magnesium | Dissolved Magnesium | Total Manganese | Dissolved Manganese | Total Sodium |
|----------------------|--------------|----------------|--------------------|--------------|------------------|------------|----------------|---------------|-------------------|-----------------|---------------------|-----------------|---------------------|-----------------|---------------------|--------------|
| WDNR ES | | 100 | | 1300 | | 300 | | 2 | | | | | | 50 | | |
| WDNR PAL | | 10 | | 130 | | 150 | | 0.2 | | | | | | 25 | | |
| Groundwater : | | | | | | | | | | | | | | | | |
| MW-3 | 08-Feb-95 | | <6.5 | | <4.8 | | 153 | | <0.09 | | <1370 | | 34300 | | 15.8 | |
| MW-3 | 08-Feb-95 | <6.5 | | <4.8 | | 581 | | <0.09 | | <1370 | | 34100 | | 17.3 | | * 3430 |
| MW-3 | 06-Mar-95 | | <6.5 | | * 5.6 | | 384 | | <0.09 | | * 1370 | | 35400 | | 31.8 | |
| MW-3 | 06-Mar-95 | <6.5 | | * 7.6 | | 1180 | | <0.09 | | * 1660 | | 35000 | | 34.3 | | * 3970 |
| MW-5 | 08-Feb-95 | | 15 | | <4.8 | | 625 | | <0.09 | | <1370 | | 24000 | | * 8.2 | |
| MW-5 | 09-Mar-95 | | <6.5 | | * 5.0 | | * 23.9 | | * 0.10 | | <1370 | | 25300 | | * 4.2 | |
| MW-9 | 13-Feb-95 | | <6.5 | | <4.8 | | <10.6 | | <0.09 | | * 1760 | | 25100 | | <0.64 | |
| MW-9 | 09-Mar-95 | | <6.5 | | * 6.4 | | <10.6 | | * 0.14 | | * 1380 | | 24100 | | * 2.8 | |
| WW-11 | 21-Feb-95 | | <6.5 | | <4.8 | | <10.6 | | * 0.10 | | * 3040 | | 18400 | | * 3.0 | |
| WW-11 | 21-Feb-95 | <6.5 | | 826 | | 99.7 | | * 0.15 | | <1370 | | 20100 | | * 8.3 | | * 3290 |
| WW-11 | 09-Mar-95 | | <6.5 | | * 5.2 | | 137 | | * 0.10 | | * 2230 | | 20800 | | * 8.7 | |
| WW-11 | 09-Mar-95 | * 6.9 | | * 10.5 | | 2620 | | * 0.18 | | * 3050 | | 26500 | | 96.7 | | 4220 |
| WW-13 | 09-Feb-95 | | <6.5 | | <4.8 | | <10.6 | | <0.09 | | * 2010 | | 35700 | | 76.5 | |
| WW-13 | 09-Feb-95 | <6.5 | | <4.8 | | 619 | | <0.09 | | * 2360 | | 38200 | | 160 | | 11200 |
| WW-13 dup | 09-Feb-95 | | <6.5 | | <4.8 | | <10.6 | | * 0.10 | | * 2180 | | 36900 | | 107 | |
| WW-13 dup | 09-Feb-95 | <6.5 | | | | 362 | | <0.09 | | * 2470 | | 38400 | | 146 | | 11500 |
| WW-13 | 09-Mar-95 | | <6.5 | | * 5.2 | | <10.6 | | * 0.10 | | * 1850 | | 41900 | | 28.0 | |
| WW-13 | 09-Mar-95 | 13.2 | | * 15.8 | | 3420 | | * 0.12 | | 4450 | | 47100 | | 228 | | 8990 |
| WW-13 dup | 09-Mar-95 | | <6.5 | | <4.8 | | <10.6 | | * 0.13 | | * 1830 | | 41600 | | 26.0 | |
| WW-13 dup | 09-Mar-95 | 52.2 | | * 16.6 | | 3570 | | * 0.15 | | 4700 | | 46500 | | 222 | | 9070 |
| WW15A | 07-Feb-95 | | <6.5 | | <4.8 | | <10.6 | | <0.09 | | * 1830 | | 16700 | | 15.5 | |
| WW15A | 07-Mar-95 | | * 6.9 | | <4.8 | | * 16.6 | | * 0.12 | | * 1600 | | 15400 | | 22.3 | |
| 786 McCutcheon | 16-Feb-95 | <6.5 | | 35.4 | | 2620 | | <0.09 | | * 1470 | | 24500 | | 80.5 | | * 3690 |
| 786 McCutcheon dup | 16-Feb-95 | <6.5 | | 24 | | 2580 | | <0.09 | | * 1490 | | 24300 | | 78.4 | | * 3740 |
| 786 McCutcheon | 01-Mar-95 | <6.5 | | 28.3 | | 5030 | | * 0.15 | | * 1520 | | 24200 | | 179 | | * 3830 |
| 786 McCutcheon dup | 01-Mar-95 | <6.5 | | * 6.4 | | 5010 | | * 0.10 | | <1370 | | 24200 | | 180 | | * 3790 |
| 963 LaBarge | 06-Feb-95 | <6.5 | | 289 | | 179 | | <0.09 | | <1370 | | 33400 | | * 0.84 | | 5310 |
| 963 LaBarge | 02-Mar-95 | <6.5 | | * 9.9 | | 6400 | | * 0.13 | | * 1480 | | 24900 | | 26.1 | | * 3450 |
| 980 Cty. Rd. A. | 06-Feb-95 | <6.5 | | * 15.5 | | 496 | | <0.09 | | <1370 | | 24300 | | 12.6 | | * 3110 |
| 980 Cty. Rd. A. | 06-Mar-95 | 16.5 | | 25.5 | | 760 | | * 0.13 | | <1370 | | 33900 | | 12.6 | | 5600 |

Table 4-1: Metals in Groundwater and Leachate (1995 Concentrations)
Junker Landfill - Hudson Township, Wisconsin

| Client ID | Date Sampled | Total Chromium | Dissolved Chromium | Total Copper | Dissolved Copper | Total Iron | Dissolved Iron | Total Mercury | Dissolved Mercury | Total Potassium | Dissolved Potassium | Total Magnesium | Dissolved Magnesium | Total Manganese | Dissolved Manganese | Total Sodium |
|------------|--------------|----------------|--------------------|--------------|------------------|------------|----------------|---------------|-------------------|-----------------|---------------------|-----------------|---------------------|-----------------|---------------------|--------------|
| WDNR ES | | 100 | | 1300 | | 300 | | 2 | | | | | | 50 | | |
| WDNR PAL | | 10 | | 130 | | 150 | | 0.2 | | | | | | 25 | | |
| Leachate : | | | | | | | | | | | | | | | | |
| GEW-7 | 21-Dec-94 | 16.6 | | * 6.5 | | 6150 | | <0.20 | | 676000 | | 217000 | | 179 | | 1110000 |
| GEW-7 | 09-Feb-95 | 19.1 | | 23.3 | | 5740 | | <0.09 | | 615000 | | 210000 | | 166 | | 1040000 |
| GEW-8 | 09-Feb-95 | 18.6 | | * 16.9 | | 3500 | | * 0.10 | | 744000 | | 274000 | | 153 | | 1200000 |
| GEW-9 | 21-Dec-94 | 27.0 | | <6.0 | | 11500 | | <0.20 | | 723000 | | 215000 | | 182 | | 1160000 |
| GEW-9 | 09-Feb-95 | 13.9 | | 45.6 | | 18500 | | <0.09 | | 602000 | | 228000 | | 293 | | 960000 |
| GEW-10 | 09-Feb-95 | 24.8 | | * 7.7 | | 3970 | | <0.09 | | 837000 | | 166000 | | 104 | | 1230000 |
| LHW-1 | 09-Feb-95 | 33.5 | | 45.6 | | 18500 | | <0.09 | | 673000 | | 241000 | | 334 | | 1110000 |
| Blanks : | | | | | | | | | | | | | | | | |
| MW-302 | 07-Feb-95 | | <6.5 | | <4.8 | | <10.6 | | <0.09 | | <1370 | | <48.4 | | <0.64 | |
| MW-303 | 09-Feb-95 | | <6.5 | | <4.8 | | 138 | | <0.09 | | <1370 | | <48.4 | | * 1.6 | |
| MW-304 | 07-Mar-95 | | <6.5 | | <4.8 | | * 14.8 | | * 0.12 | | <1370 | | * 59.3 | | * 3.3 | |
| MW-9MS | 09-Mar-95 | | <6.48 | | * 5.22 | | <10.6 | | * 0.11 | | <1368 | | 24378 | | * 4.03 | |
| MW-9MS dup | 09-Mar-95 | | 162 | | 200 | | 834 | | 0.97 | | <1368 | | 24116 | | 390 | |

Concentrations in ug/L

* : Estimated Concentration

Table 4-1: Metals in Groundwater and Leachate (1995 Concentrations)
Junker Landfill - Hudson Township, Wisconsin

| Client ID | Date Sampled | Dissolved Sodium | Total Nickel | Dissolved Nickel | Total Lead | Dissolved Lead | Total Antimony | Dissolved Antimony | Total Selenium | Dissolved Selenium | Total Thallium | Dissolved Thallium | Total Vanadium | Dissolved Vanadium | Total Zinc | Dissolved Zinc |
|----------------------|--------------|------------------|--------------|------------------|------------|----------------|----------------|--------------------|----------------|--------------------|----------------|--------------------|----------------|--------------------|------------|----------------|
| WDNR ES | | | | | 15 | | | | 50 | | | | | | 5000 | |
| WDNR PAL | | | | | 1.5 | | | | 10 | | | | | | 2500 | |
| Groundwater : | | | | | | | | | | | | | | | | |
| MW-3 | 08-Feb-95 | * 3460 | | <7.9 | | * 2.4 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 4.3 |
| MW-3 | 08-Feb-95 | | <7.9 | | 5 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 20.1 | |
| MW-3 | 06-Mar-95 | 4260 | | <7.9 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 12.6 |
| MW-3 | 06-Mar-95 | | <7.9 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 20.5 | |
| MW-5 | 08-Feb-95 | * 3400 | | <7.9 | | 28.4 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 3.6 |
| MW-5 | 09-Mar-95 | * 3900 | | <7.9 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 8.0 |
| MW-9 | 13-Feb-95 | 4720 | | <7.9 | | * 3.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 11.0 |
| MW-9 | 09-Mar-95 | 4070 | | <7.9 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 8.4 |
| WW-11 | 21-Feb-95 | 6340 | | <7.9 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 4.9 |
| WW-11 | 21-Feb-95 | | <7.9 | | 9.4 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 778 | |
| WW-11 | 09-Mar-95 | * 3800 | | <7.9 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 7.8 |
| WW-11 | 09-Mar-95 | | <7.9 | | * 2.8 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 41.1 | |
| WW-13 | 09-Feb-95 | 11900 | | <7.9 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 17.5 |
| WW-13 | 09-Feb-95 | | <7.9 | | * 1.4 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 14.1 | |
| WW-13 dup | 09-Feb-95 | 11700 | | <7.9 | | * 1.1 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 26.9 |
| WW-13 dup | 09-Feb-95 | | <7.9 | | * 2.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 11.3 | |
| WW-13 | 09-Mar-95 | 8590 | | <7.9 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 9.7 |
| WW-13 | 09-Mar-95 | | * 13.3 | | * 2.4 | | <27.6 | | <2.0 | | <2.0 | | * 9.3 | | 38.3 | |
| WW-13 dup | 09-Mar-95 | 8730 | | <7.9 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 8.7 |
| WW-13 dup | 09-Mar-95 | | 38.1 | | * 2.3 | | <27.6 | | <2.0 | | <2.0 | | * 8.8 | | 36.1 | |
| WW15A | 07-Feb-95 | 52900 | | <7.9 | | 11.4 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 2.7 |
| WW15A | 07-Mar-95 | 49000 | | <7.9 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 6.2 |
| 786 McCutcheon | 16-Feb-95 | | <7.9 | | 4.4 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 490 | |
| 786 McCutcheon dup | 16-Feb-95 | | <7.9 | | 8.7 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 465 | |
| 786 McCutcheon | 01-Mar-95 | | <7.9 | | 6.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 246 | |
| 786 McCutcheon dup | 01-Mar-95 | | <7.9 | | * 2.4 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 218 | |
| 963 LaBarge | 06-Feb-95 | | <7.9 | | 12.5 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 2150 | |
| 963 LaBarge | 02-Mar-95 | | <7.9 | | 3.3 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 211 | |
| 980 Cty. Rd. A. | 06-Feb-95 | | <7.9 | | * 2.8 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 120 | |
| 980 Cty. Rd. A. | 06-Mar-95 | | * 10.4 | | * 2.8 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | 270 | |

Table 4-1: Metals in Groundwater and Leachate (1995 Concentrations)
Junker Landfill - Hudson Township, Wisconsin

| Client ID | Date Sampled | Dissolved Sodium | Total Nickel | Dissolved Nickel | Total Lead | Dissolved Lead | Total Antimony | Dissolved Antimony | Total Selenium | Dissolved Selenium | Total Thallium | Dissolved Thallium | Total Vanadium | Dissolved Vanadium | Total Zinc | Dissolved Zinc |
|-------------------|--------------|------------------|--------------|------------------|------------|----------------|----------------|--------------------|----------------|--------------------|----------------|--------------------|----------------|--------------------|------------|----------------|
| WDNR ES | | | | | 15 | | | | 50 | | | | | | 5000 | |
| WDNR PAL | | | | | 1.5 | | | | 10 | | | | | | 2500 | |
| Leachate : | | | | | | | | | | | | | | | | |
| GEW-7 | 21-Dec-94 | | 212 | | <1.0 | | <42.7 | | <2.0 | | <2.0 | | * 32.1 | | 25.0 | |
| GEW-7 | 09-Feb-95 | | 195 | | * 1.4 | | <27.6 | | <2.0 | | <2.0 | | * 27.9 | | 39.4 | |
| GEW-8 | 09-Feb-95 | | 194 | | 5.2 | | <27.6 | | <2.0 | | <2.0 | | * 26.8 | | 35.5 | |
| GEW-9 | 21-Dec-94 | | 174 | | <1.0 | | <42.7 | | <2.0 | | <2.0 | | * 19.7 | | * 18.4 | |
| GEW-9 | 09-Feb-95 | | 118 | | 7 | | <27.6 | | <2.0 | | <2.0 | | * 15.8 | | 81.8 | |
| GEW-10 | 09-Feb-95 | | 237 | | 6.6 | | <27.6 | | <10.0 | | <2.0 | | * 35.6 | | 24.3 | |
| LHW-1 | 09-Feb-95 | | 202 | | 8.4 | | <27.6 | | <2.0 | | <2.0 | | * 15.9 | | 113 | |
| Blanks : | | | | | | | | | | | | | | | | |
| MW-302 | 07-Feb-95 | <221 | | <7.9 | | 11.8 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 3.3 |
| MW-303 | 09-Feb-95 | <221 | | <7.9 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 6.0 |
| MW-304 | 07-Mar-95 | * 268 | | <7.9 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.6 | | * 4.4 |
| MW-9MS | 09-Mar-95 | * 3966 | | <7.92 | | <1.0 | | <27.6 | | <2.0 | | <2.0 | | <6.64 | | * 9.07 |
| MW-9MS dup | 09-Mar-95 | 4057 | | 393 | | 20.9 | | 447 | | 9.0 | | 57.3 | | 406 | | 392 |

Concentrations in ug/L
 * : Estimated Concentration

Table 4-2: Historical Maximum VOCs and SVOCs Concentrations in the Groundwater and Leachate
Junker Landfill - Hudson Township, Wisconsin

| Compound | Well | 1995 Date | Concentration (ug/l) | | Historical Date | Well |
|----------------------------|-----------------------|-----------|----------------------|-------|-----------------|-----------------------|
| Groundwater: | | | | | | |
| 1,1,1-Trichloroethane | 963 La Barge Rd. | 06-Feb-95 | 0.5 | 74.0 | 11-Mar-91 | MW-7 |
| 1,1,2,2-Tetrachloroethane | MW-5 | 08-Feb-95 | J2 | ND | | |
| 1,1,-Dichloroethane | Troop House G.S. Camp | 06-Feb-95 | 1 | 15.0 | 26-Nov-84 | 890 E. Hwy. 12 |
| 1,1,-Dichloroethene | MW-5 | 08-Feb-95 | J1 | 0.2 | 01-Mar-89 | 923 La Barge Rd. |
| 1,2-Dichloroethane | | | ND | 1.2 | 21-Sep-92 | MW-3 |
| 1,2-Dichloropropane | | | ND | 1.4 | 21-Sep-92 | MW-4 |
| 1,2,3-Trichlorobenzene | 980 Cty. Rd. A | 06-Feb-95 | 0.3 | ND | | |
| 1,3-Dichloropropane | | | ND | 3.4 | 03-Mar-92 | MW-3 |
| 2,2-Dichloropropane | | | ND | 7.8 | 03-Mar-92 | MW-8 |
| Benzene | WW-15B | 07-Feb-95 | 7 | 3.4 | 21-Sep-92 | MW-8 |
| bis(2-Ethylhexyl)Phthalate | WW-15A | 07-Mar-95 | J3 | ND | | |
| Chlorobenzene | | | ND | 1.5 | 07-Feb-85 | Windy Acre G.S. Camp |
| Chloroethane | Troop House G.S. Camp | 06-Feb-95 | 0.8 | ND | | |
| Chloromethane | St Croix Co Garage | 02-Mar-95 | 0.8 | 2.2 | 03-Mar-92 | MW-3 |
| Cis-1,2-Dichlorethene | | | ND | 15.0 | 21-Sep-92 | MW-8 |
| Cis-1,3-dichloropropene | | | ND | 3.6 | 11-Mar-91 | MW-9 |
| Dibromochloromethane | 928 Cty Rd A dup | 06-Feb-95 | 0.7 | ND | | |
| Dichlorodifluoromethane | WW-12 dup | 31-Jan-95 | 18.0 | 19.0 | 24-Sep-91 | MW-6 |
| Dichloroflouromethane | | | ND | 14.0 | 25-Nov-85 | MW-4 |
| Di-n-Butylphthalate | MW-9 | 13-Feb-95 | J0.7 | ND | | |
| Ethyl benzene | | | ND | 3.1 | 03-Mar-92 | MW-8 |
| Ethylether | | | ND | 4.4 | 05-Apr-94 | Troop House G.S. Camp |
| Fluorotrichloromethane | | | ND | 7.9 | 24-Sep-91 | MW-3 |
| Methylene Chloride | MW-5 | 09-Mar-95 | 1.0 | 18.0 | 23-Jun-93 | NL MW-12 |
| Methyl Ethyl Ketone | WW-15A | 07-Feb-95 | J3 | ND | | |
| Methyl-T-butyl ether | | | ND | 1.4 | 21-Sep-92 | MW-8 |
| Naphthalene | MW-5 | 08-Feb-95 | 1.0 | ND | | |
| Styrene | | | ND | 4.8 | 03-Mar-92 | MW-3 |
| Tert-Butyl benzene | | | ND | 1.0 | 21-Sep-92 | MW-8 |
| Tetrachloroethene | 932 La Barge Rd. | 01-Mar-95 | 1.0 | 17.0 | 26-Nov-84 | 890 E. Hwy. 12 |
| Toluene | WW-16 | 08-Mar-95 | 13.0 | 11.6 | 17-Dec-90 | MW-4 |
| Total phenols | | | ND | 4.0 | 23-Apr-76 | MW-2 |
| Trans-1-2-dichloroethene | 963 La Barge Rd. | 06-Feb-95 | 0.4 | 9.5 | 11-Feb-85 | Troop House G.S. Camp |
| Trans-1,3-dichloropropene | | | ND | 1.3 | 07-Feb-85 | Caretaker G.S. Camp |
| Trichloroethene | 890 E. Hwy. 12 | 05-Feb-95 | 25 | 54.0 | 07-Jan-85 | 898 E. Hwy. 12 |
| Trichlorofluoromethane | WW-12 | 28-Feb-95 | 15.0 | 35.0 | 03-Feb-85 | 848 Yellowstone Trail |
| Vinyl chloride | | | ND | 14.0 | 24-Sep-91 | MW-6 |
| Xylene | | | ND | 4.8 | 24-Sep-91 | MW-6 |
| Leachate: | | | | | | |
| 1,2,4-Trimethylbenzene | | | ND | 42.0 | 03-Mar-92 | LHW-1 |
| 1,3,5-Trimethyl benzene | | | ND | 27.0 | 03-Mar-92 | LHW-1 |
| 2-Methylphenol | GEW #10 | 09-Feb-95 | J21 | ND | | |
| 4-Chloro-3-Methylphenol | GEW #8 | 09-Feb-95 | 110 | ND | | |
| 4-Methylphenol | GEW #9 | 09-Feb-95 | J41 | ND | | |
| Benzene | | | ND | 4.8 | 03-Mar-92 | LHW-1 |
| bis(2-Ethylhexyl)Phthalate | LHW-1 | 09-Feb-95 | J78 | ND | | |
| Chlorobenzene | | | ND | 2.2 | 03-Mar-92 | LHW-1 |
| Chloroethane | | | ND | 5.4 | 22-Jun-93 | LHW-1 |
| Ethyl benzene | GEW#9 | 09-Feb-95 | 250 | 130.0 | 03-Mar-92 | LHW-1 |
| Dichlorodifluoromethane | | | ND | 6.6 | 03-Mar-92 | LHW-1 |
| Isopropyl benzene | | | ND | 9.3 | 03-Mar-92 | LHW-1 |
| isopropyl toluene | | | ND | 24.0 | 03-Mar-92 | LHW-1 |
| Naphthalene | GEW#10 | 09-Feb-95 | 66 | 21.0 | 21-Sep-92 | LHW-1 |
| n-Butylbenzene | | | ND | 9.0 | 03-Mar-92 | LHW-1 |
| n-Propyl benzene | | | ND | 40.0 | 03-Mar-92 | LHW-1 |
| p-dichlorobenzene | | | ND | 18.0 | 02-Mar-93 | LHW-1 |
| sec-Butylbenzene | | | ND | 12.0 | 03-Mar-92 | LHW-1 |
| Styrene | | | ND | 280.0 | 03-Mar-92 | LHW-1 |
| Tert-Butyl benzene | | | ND | 46.0 | 21-Sep-92 | LHW-1 |
| Tetrahydrofuran | GEW#9 | 09-Feb-95 | 44000E | ND | | |
| Toluene | GEW#10 | 09-Feb-95 | 110 | 7.7 | 21-Sep-92 | LHW-1 |
| Vinyl chloride | | | ND | 5.2 | 03-Mar-92 | LHW-1 |
| Xylene | GEW#9 | 09-Feb-95 | 1000 | 330.0 | 21-Sep-92 | LHW-1 |

Note: Refer to the Appendix D for a complete list of detections.

**Table 4-3: Historical List of Compounds Detected in Groundwater, Leachate, and Landfill Gas
Junker Landfill - Hudson Township, Wisconsin**

[illegible]

Table 5-1: Suggestive Half-Life Data
Junker Landfill - Hudson Township, Wisconsin

| Compound | Environmental Half-Life | | |
|-------------------------|-------------------------|---------------------|------------------------|
| | Soil | Groundwater | Atmosphere |
| Trichloroethene | 10 days - 1 year | 90 days - 4.5 years | 1 day - 10 days (a) |
| Tetrachloroethene | 10 days - 1 year | 1 year - 2 years | 10 days - 150 days (b) |
| Dichlorodifluoromethane | 30 days - 30 years | 60 days - 1 year | 1 year - 70 years (c) |
| Trichlorofluoromethane | 180 days - 1 year | 1 year - 2 years | 1 year - 150 years (c) |
| Tetrahydrofuran (d) | -- | -- | -- |
| o-Xylene | 7 days - 30 days | 14 days - 1 year | 0.2 hour - 40 hours |
| m-Xylene | 7 days - 30 days | 14 days - 1 year | 0.8 hour - 30 hours |
| p-Xylene | 2 days - 30 days | 14 days - 1 year | 0.2 hour - 40 hours |

Source: Mackay et al. (1992)

Notes: (a) Based on photooxidation rates
 (b) Based on rates of reaction with OH radicals
 (c) Lifetime in troposphere (lower atmosphere)
 (d) Half-life data not available

Table 5-2: Environmental Transport Parameters
Junker Landfill - Hudson Township, Wisconsin

| Compound | Molecular Weight (g/mol) | Water Solubility (ug/l) | Vapor Pressure (mm Hg) | Henry's Law Constant (atm-cubic meters/mol) | Org-C Partition Coefficient (ml/g) |
|-------------------------|--------------------------|-------------------------|------------------------|---|------------------------------------|
| Trichloroethene | 131 | 1,100,000 | 57.9 | 9.10E-03 | 126 |
| Tetrachloroethene | 166 | 150,000 | 17.8 | 2.59E-02 | 364 |
| Dichlorodifluoromethane | 121 | 280,000 | 4870 | 9.6E-01 (a) | 58 |
| Trichlorofluoromethane | 137 | 1,100,000 | 766 (a) | 1.1E-01 (a) | 159 |
| Tetrahydrofuran | 72 | 557,000 (b) | 165 (b) | 2.8E-02 (c) | — |
| o-Xylene | 106 | 175,000 | 6.6 (a) | 5.1E-03 (a) | 102 (a) |
| m-Xylene | 106 | 130,000 | 8.3 (a) | 7.1E-03 (a) | 219 (a) |
| p-Xylene | 106 | 198,000 | 8.8 (a) | 7.4E-03 (a) | 331 (a) |

Source: U.S. EPA (1986) except as noted

(a) Median value reported by Mackay et al. (1992)

(b) From Verschueren (1983)

(c) Based directly on water solubility and vapor pressure

**Table 5-3: Comparison of Observed Water Concentrations with Concentrations
Calculated at Equilibrium with Landfill Gas
Junker Landfill - Hudson Township, Wisconsin**

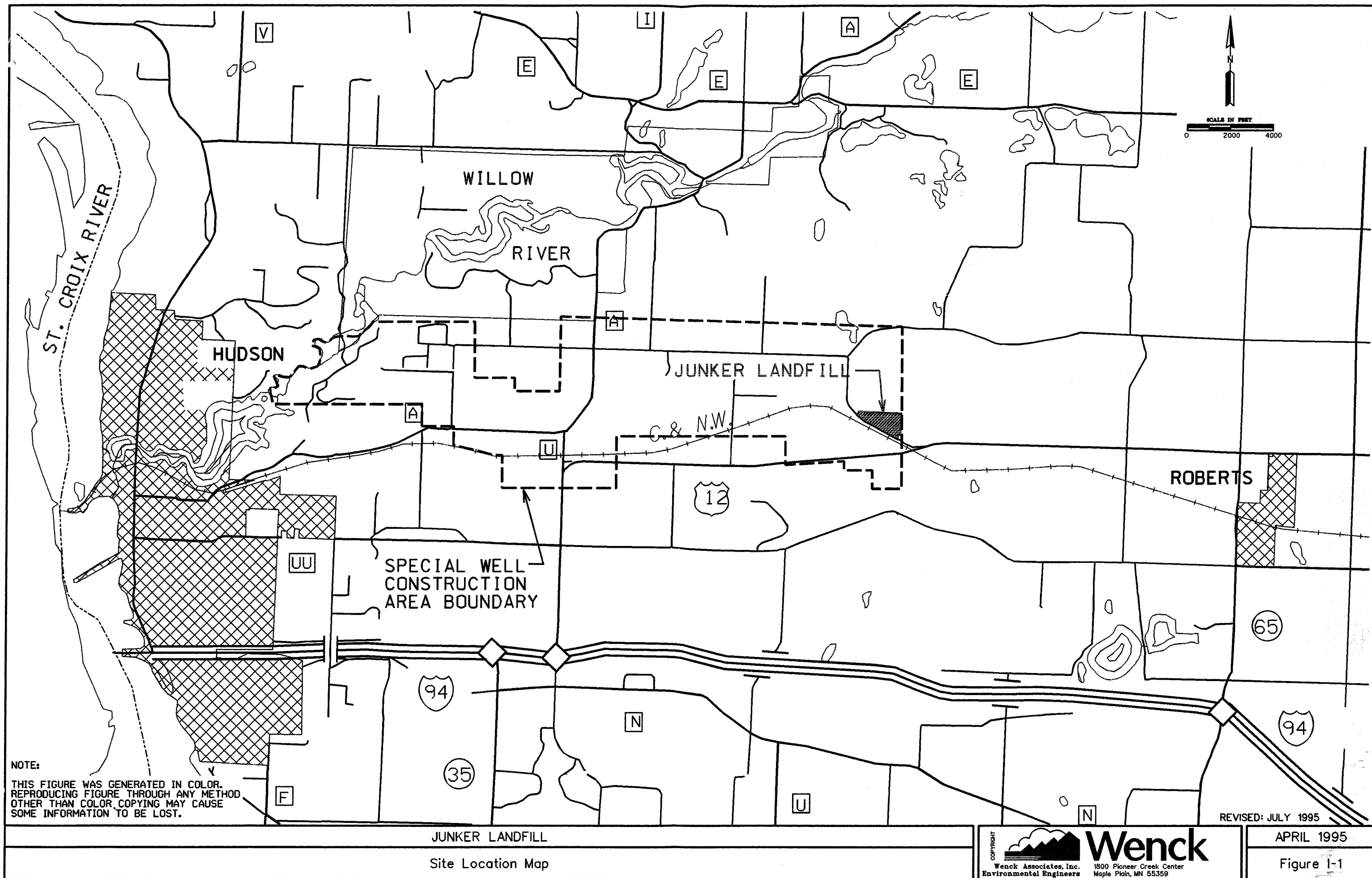
| Compound | Landfill Gas 1994 Average Concentration (ppbv) | Water Concentration at Equilibrium With Landfill gas (a) (ug/l) | Maximum Observed Concentration (b) | |
|-------------------------|---|--|---------------------------------------|-----------------------|
| | | | Leachate (ug/l) | Groundwater (ug/l) |
| Trichloroethene | 800 | 12 | 1 (c) | 28 |
| Tetrachloroethene | 1600 | 10 | 2 | 1 |
| Dichlorodifluoromethane | 600 | 0.08 | ND | 18 |
| Trichlorofluoromethane | 500 | 0.6 | ND | 12 |
| Tetrahydrofuran | -- | -- | 44,000 | ND |
| o-Xylene | 7300 | 150 | 1000 | ND |
| m,p-Xylene | 25,000 | 370 | (Total Xylenes) | ND |

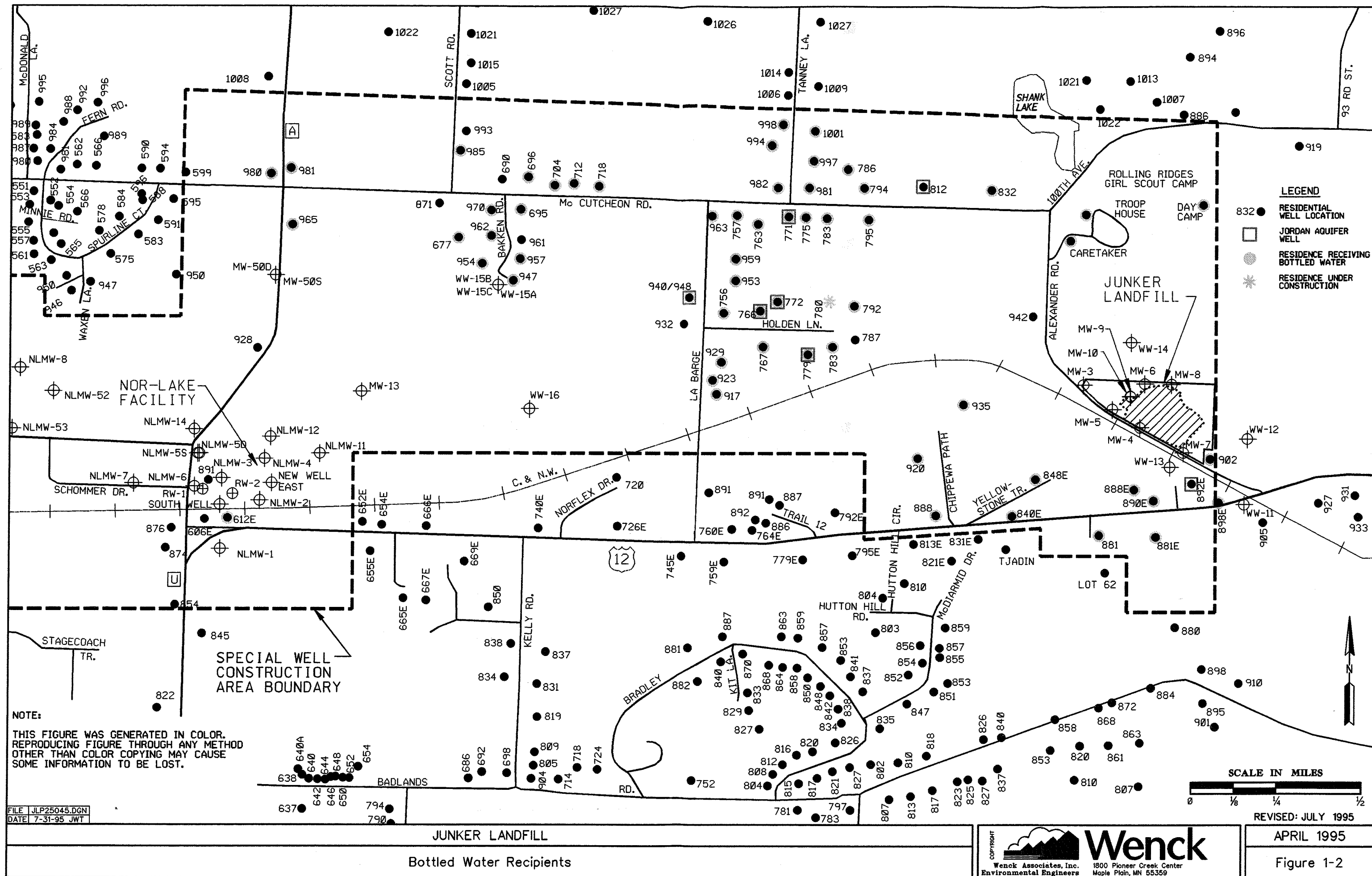
Notes:

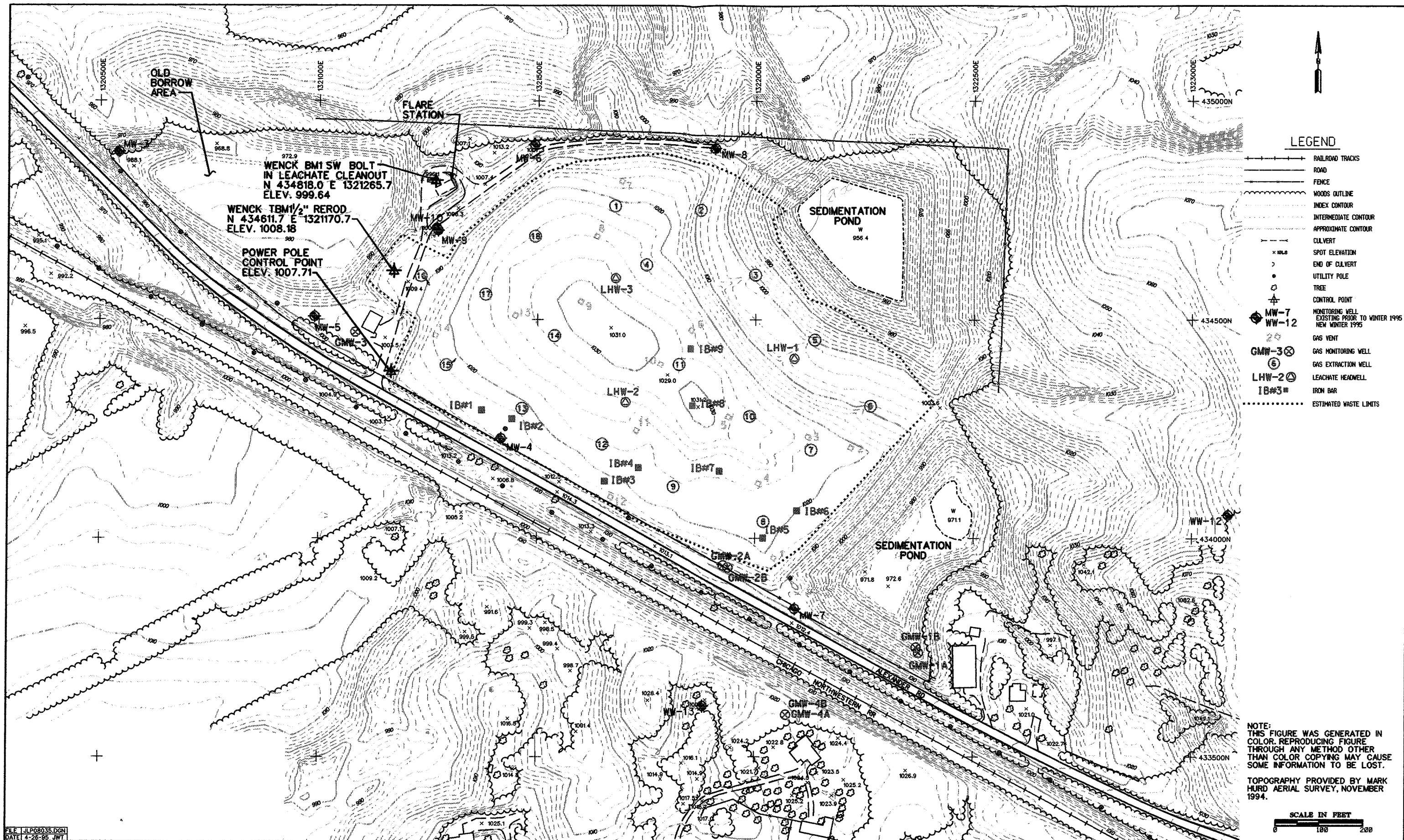
(a) Equilibrium water concentration = (landfill gas concentration, ppbv) X (10E-09 atm/ppbv) X (molecular weight, g/mol)
X (10E06 ug/g) X (10E-03 cubic meters/l) / (Henry's Law Constant, atm-cubic meter/mol).

(b) From current study

(c) Result from unvalidated analysis on sample from GEW-7 on 12/21/95.







FILE: JLP08035.DGN
DATE: 4-26-95 JMT

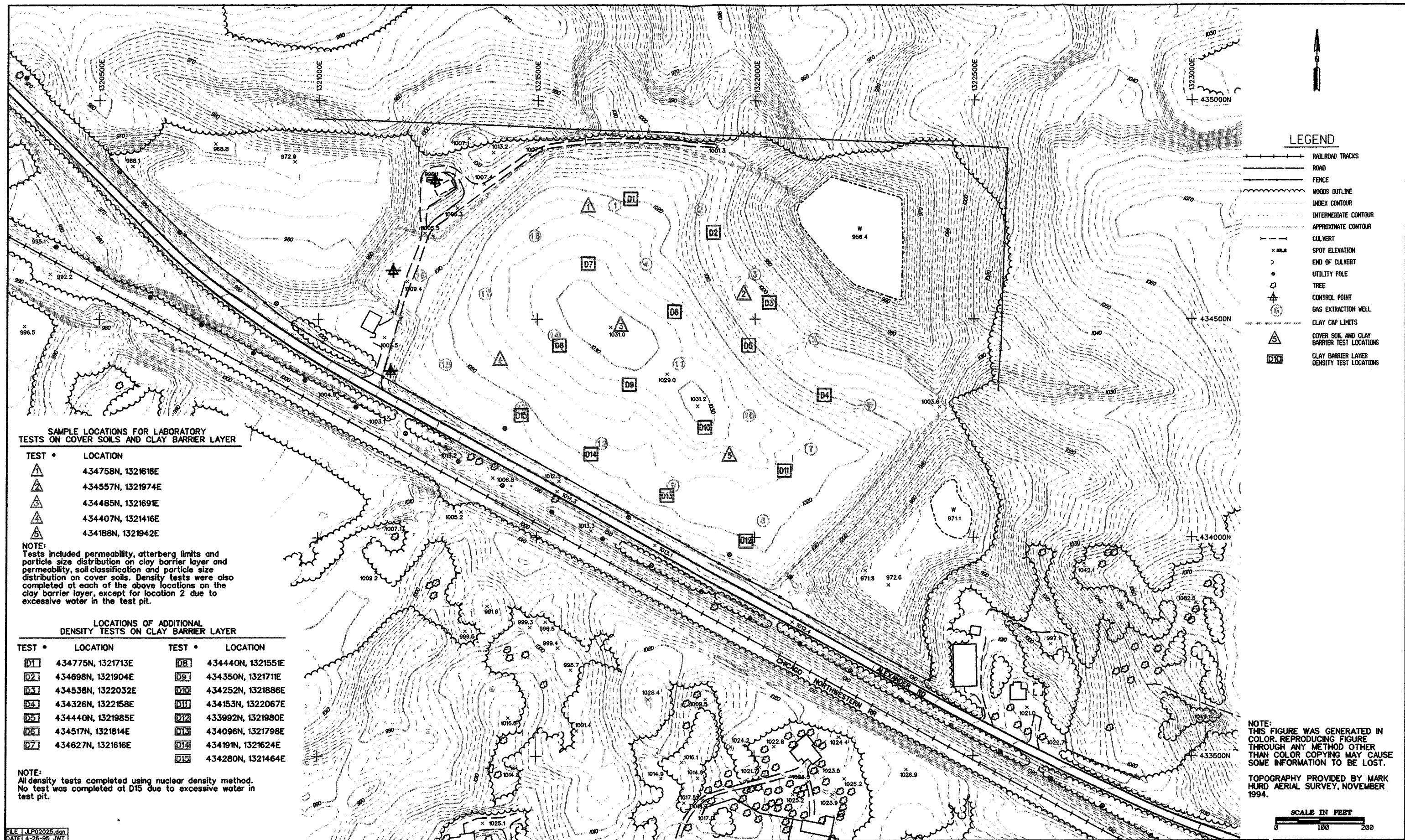
JUNKER LANDFILL

Landfill Site Features Map

Wenck
Wenck Associates, Inc. 1800 Pioneer Creek Center
Environmental Engineers Maple Plain, MN 55359

APRIL 1995

Figure 2-2



SAMPLE LOCATIONS FOR LABORATORY TESTS ON COVER SOILS AND CLAY BARRIER LAYER

| TEST • | LOCATION |
|--------|-------------------|
| 1 | 434758N, 1321616E |
| 2 | 434557N, 1321974E |
| 3 | 434485N, 1321691E |
| 4 | 434407N, 1321416E |
| 5 | 434189N, 1321942E |

NOTE:
Tests included permeability, atterberg limits and particle size distribution on clay barrier layer and permeability, soil classification and particle size distribution on cover soils. Density tests were also completed at each of the above locations on the clay barrier layer, except for location 2 due to excessive water in the test pit.

LOCATIONS OF ADDITIONAL DENSITY TESTS ON CLAY BARRIER LAYER

| TEST • | LOCATION | TEST • | LOCATION |
|--------|-------------------|--------|-------------------|
| D1 | 434775N, 1321713E | D8 | 434440N, 1321551E |
| D2 | 434698N, 1321904E | D9 | 434350N, 1321711E |
| D3 | 434538N, 1322032E | D10 | 434252N, 1321886E |
| D4 | 434326N, 1322158E | D11 | 434153N, 1322067E |
| D5 | 434440N, 1321985E | D12 | 433992N, 1321980E |
| D6 | 434517N, 1321814E | D13 | 434096N, 1321798E |
| D7 | 434627N, 1321616E | D14 | 434191N, 1321624E |
| | | D15 | 434280N, 1321464E |

NOTE:
All density tests completed using nuclear density method. No test was completed at D15 due to excessive water in test pit.

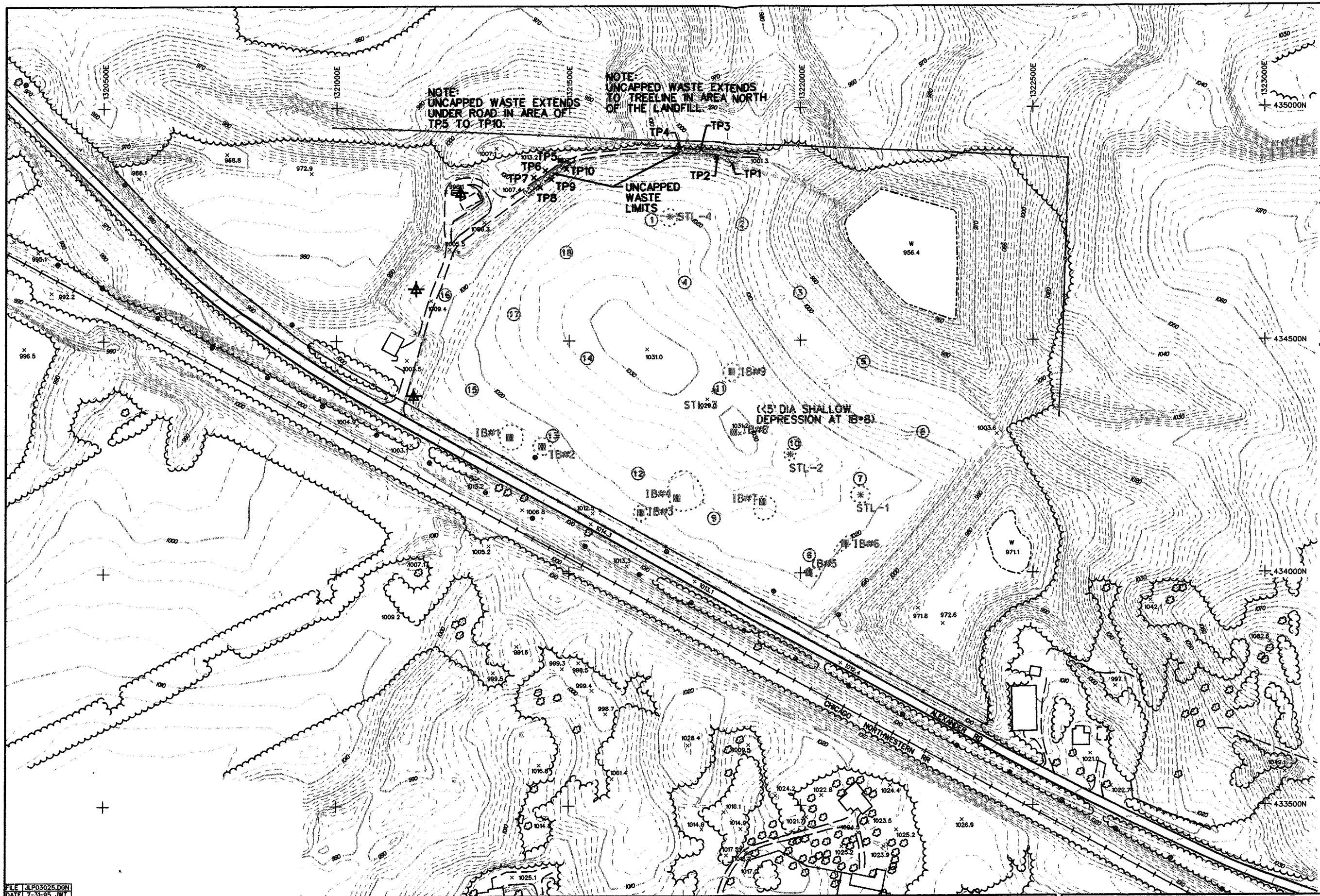
- LEGEND
- RAILROAD TRACKS
 - ROAD
 - FENCE
 - WOODS OUTLINE
 - INDEX CONTOUR
 - INTERMEDIATE CONTOUR
 - APPROXIMATE CONTOUR
 - CULVERT
 - SPOT ELEVATION
 - END OF CULVERT
 - UTILITY POLE
 - TREE
 - CONTROL POINT
 - GAS EXTRACTION WELL
 - CLAY CAP LIMITS
 - COVER SOIL AND CLAY BARRIER TEST LOCATIONS
 - CLAY BARRIER LAYER DENSITY TEST LOCATIONS

NOTE:
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JUNKER LANDFILL
Landfill Cap Testing Locations



- LEGEND**
- RAILROAD TRACKS
 - ROAD
 - FENCE
 - WOODS OUTLINE
 - INDEX CONTOUR
 - INTERMEDIATE CONTOUR
 - APPROXIMATE CONTOUR
 - CULVERT
 - SPOT ELEVATION
 - END OF CULVERT
 - UTILITY POLE
 - TREE
 - CONTROL POINT
 - CLAY CAP LIMITS
 - UNCAPPED WASTE LIMITS
 - IB#3
 - STL-2
 - 6
 - TP8x
 - APPROXIMATE EXTENT OF SETTLEMENT AREA
 - UNCAPPED WASTE

NOTE:

SETTLEMENT AREAS BASED ON VISUAL INSPECTION DONE 1/6/95

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SCALE IN FEET

0 100 200

REVISED: JULY 1995

FILE: JLP03025.DGN
DATE: 7-31-95 JMT

JUNKER LANDFILL

Uncapped Waste Limits and Settlement Areas

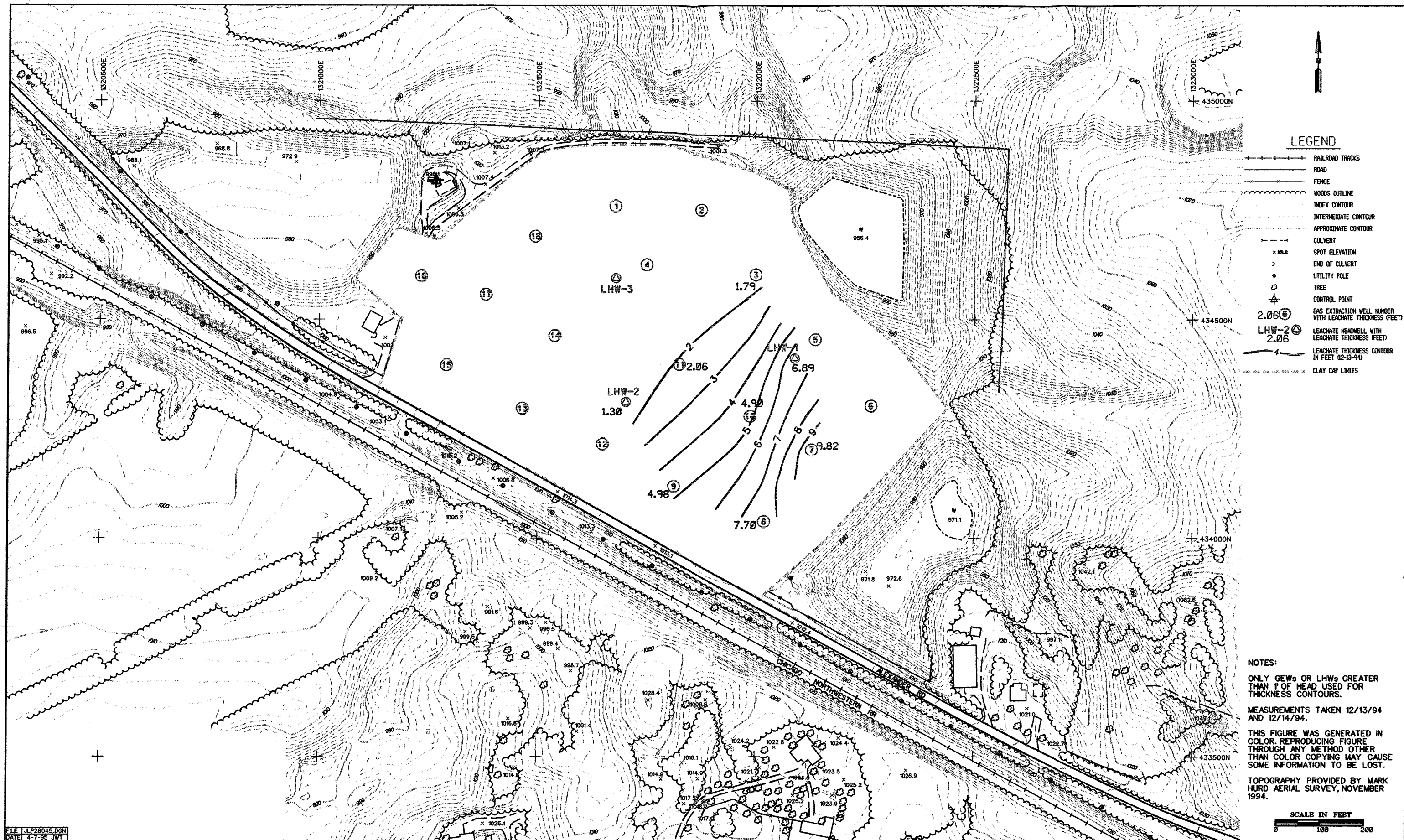
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Figure 2-4



FILE: JLP28045.DGN
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JUNKER LANDFILL

Observed Leachate Thickness Contours

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Figure 2-5



- LEGEND**
- RAILROAD TRACKS
 - ROAD
 - FENCE
 - WOODS OUTLINE
 - INDEX CONTOUR
 - INTERMEDIATE CONTOUR
 - APPROXIMATE CONTOUR
 - CULVERT
 - SPOT ELEVATION
 - END OF CULVERT
 - UTILITY POLE
 - TREE
 - CONTROL POINT
 - GAS EXTRACTION WELL WITH LEACHATE ELEVATION
 - LEACHATE HEADWELL WITH LEACHATE ELEVATION
 - LEACHATE ELEVATION CONTOURS
 - APPROXIMATE LANDFILL BASE ELEVATION CONTOURS BASED ON CONSTRUCTION PLANS AND GEV INSTALLATION LOGS
 - CLAY CAP LIMITS

NOTE:

ONLY GEWS OR LHWs WITH GREATER THAN 1' OF HEAD USED FOR ELEVATION CONTOURS.

LEACHATE DEPTH MEASUREMENTS TAKEN 12/13/94 AND 12/14/94.

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SCALE IN FEET
0 100 200

REVISED: JULY 1995

FILE: JLP04025.DGN
DATE: 7-31-95 JMT

JUNKER LANDFILL

Leachate Elevation Contours

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Figure 2-6



FILE: JLP10035.DGN
DATE: 4-26-95 JMT

JUNKER LANDFILL

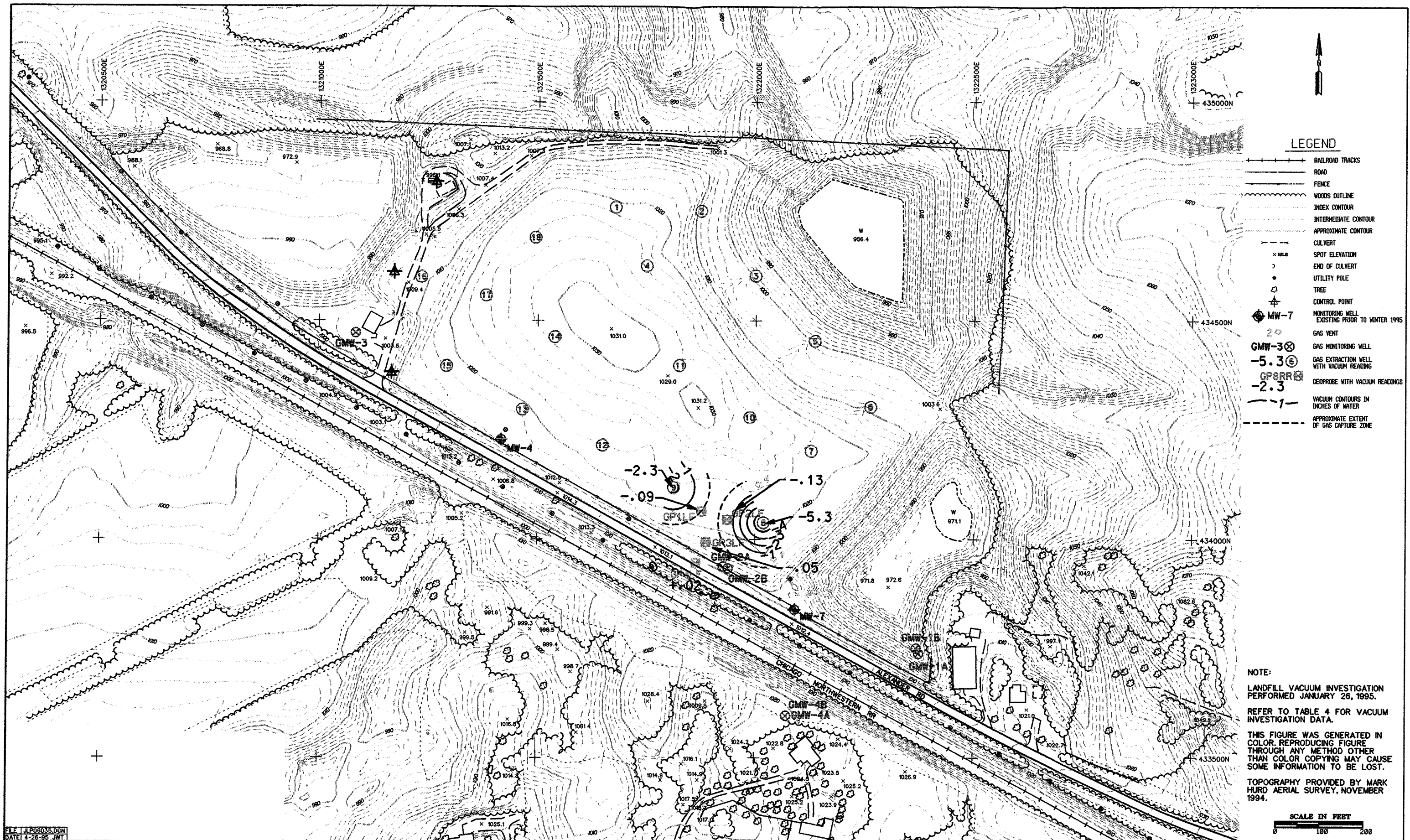
Potential Leachate Thickness Contours

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Figure 2-7



FILE JLP09035.DGN
DATE 4-26-95 JMT

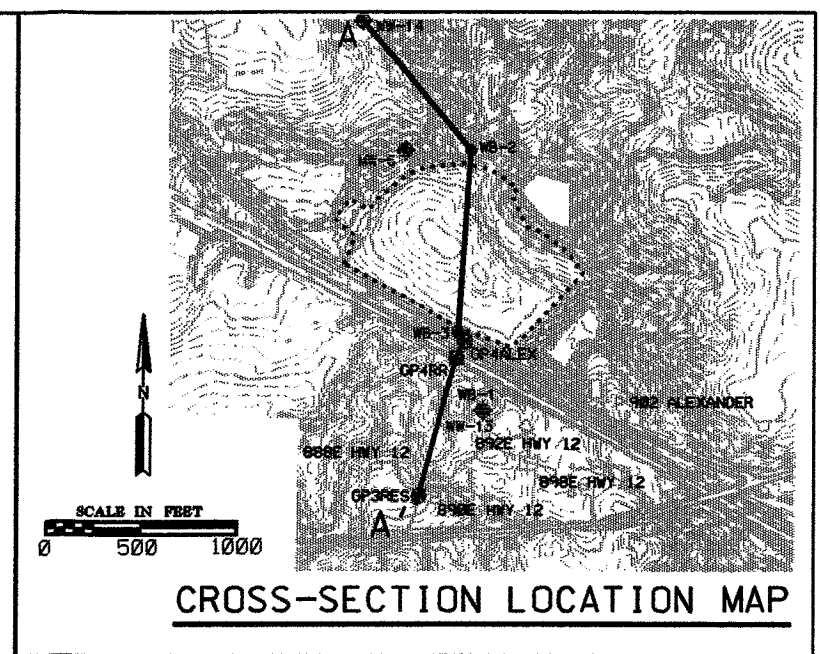
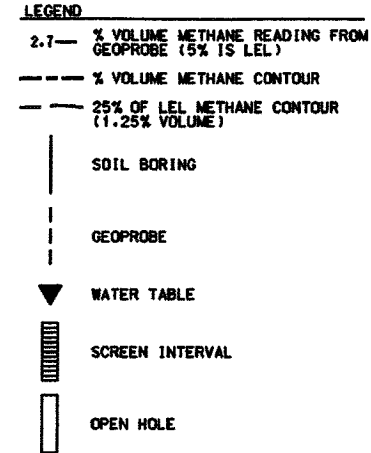
JUNKER LANDFILL

Vacuum Contours for GEW8 and GEW9 at 20 Foot Depth

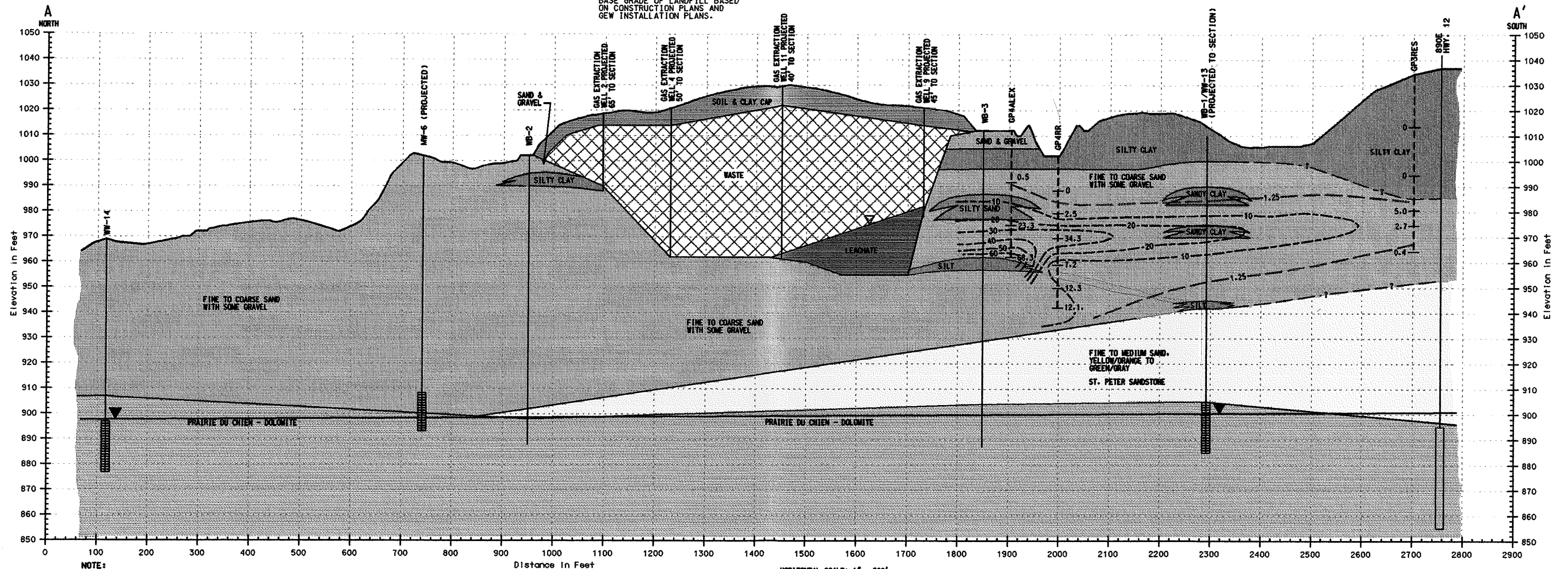
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Figure 2-8



NOTE:
BASE GRADE OF LANDFILL BASED
ON CONSTRUCTION PLANS AND
GEW INSTALLATION PLANS.



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DATE: 7-31-95 JWT

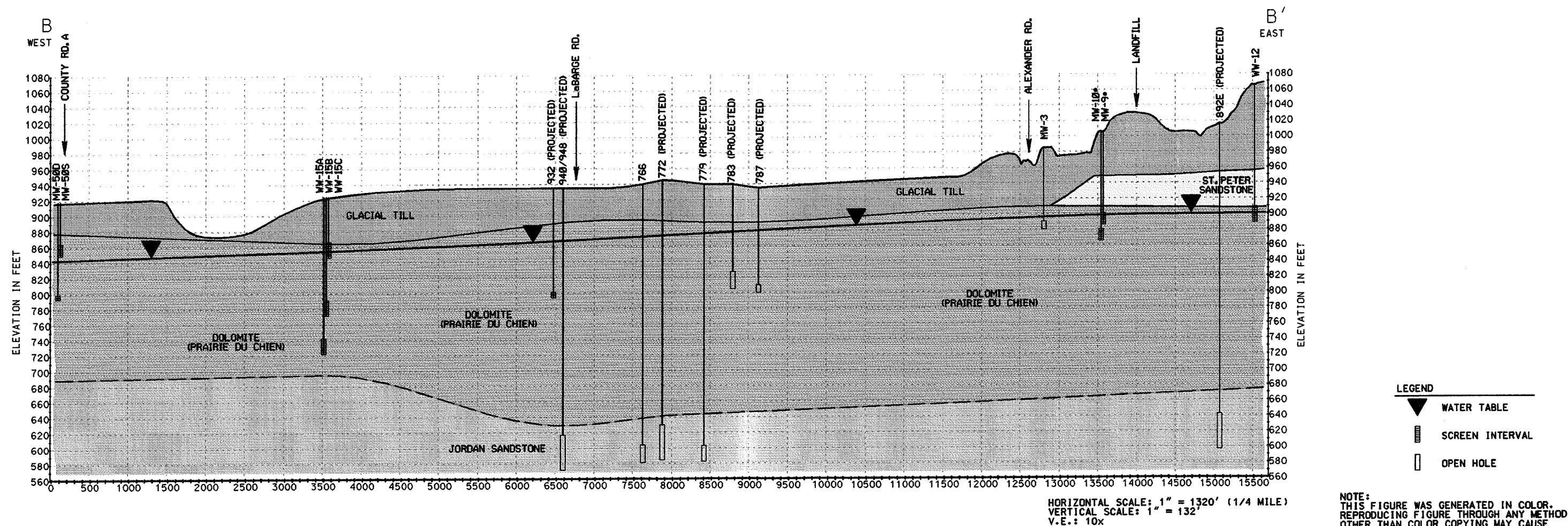
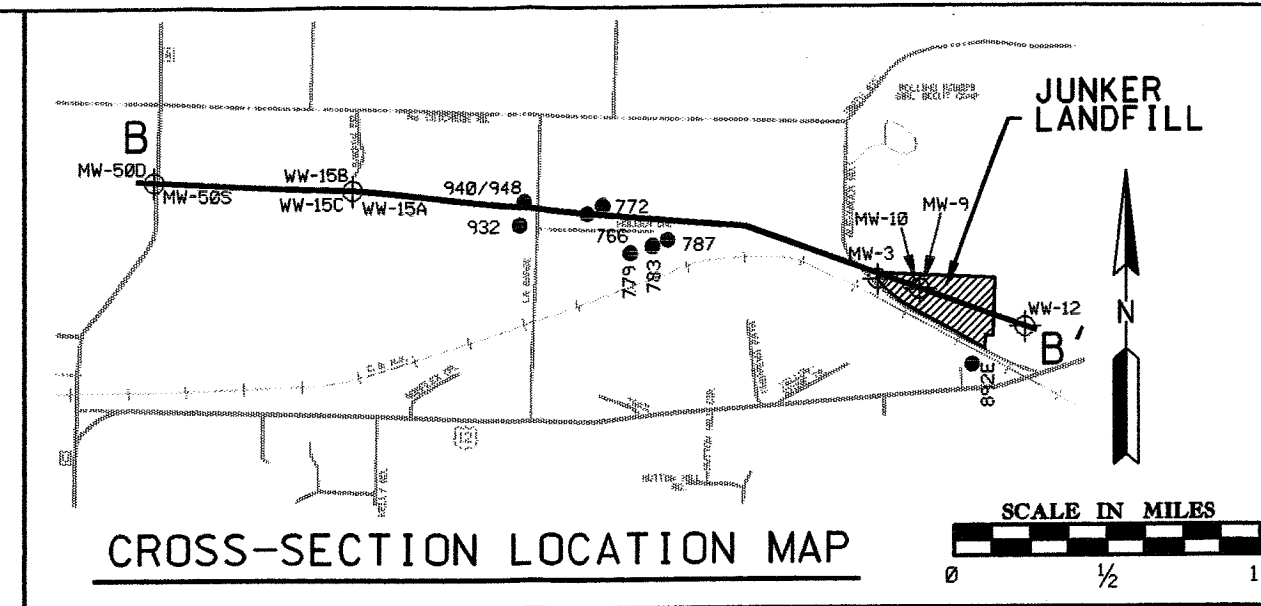
HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 40'
V.E.: 5x

JUNKER LANDFILL

LANDFILL CROSS-SECTION A-A' AND VERTICAL EXTENT OF LANDFILL GAS MIGRATION

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REVISED: JULY 1995
APRIL 1995
Figure 2-9



FILE: J1X11035.DGN
 DATE: 7-31-95 JWT

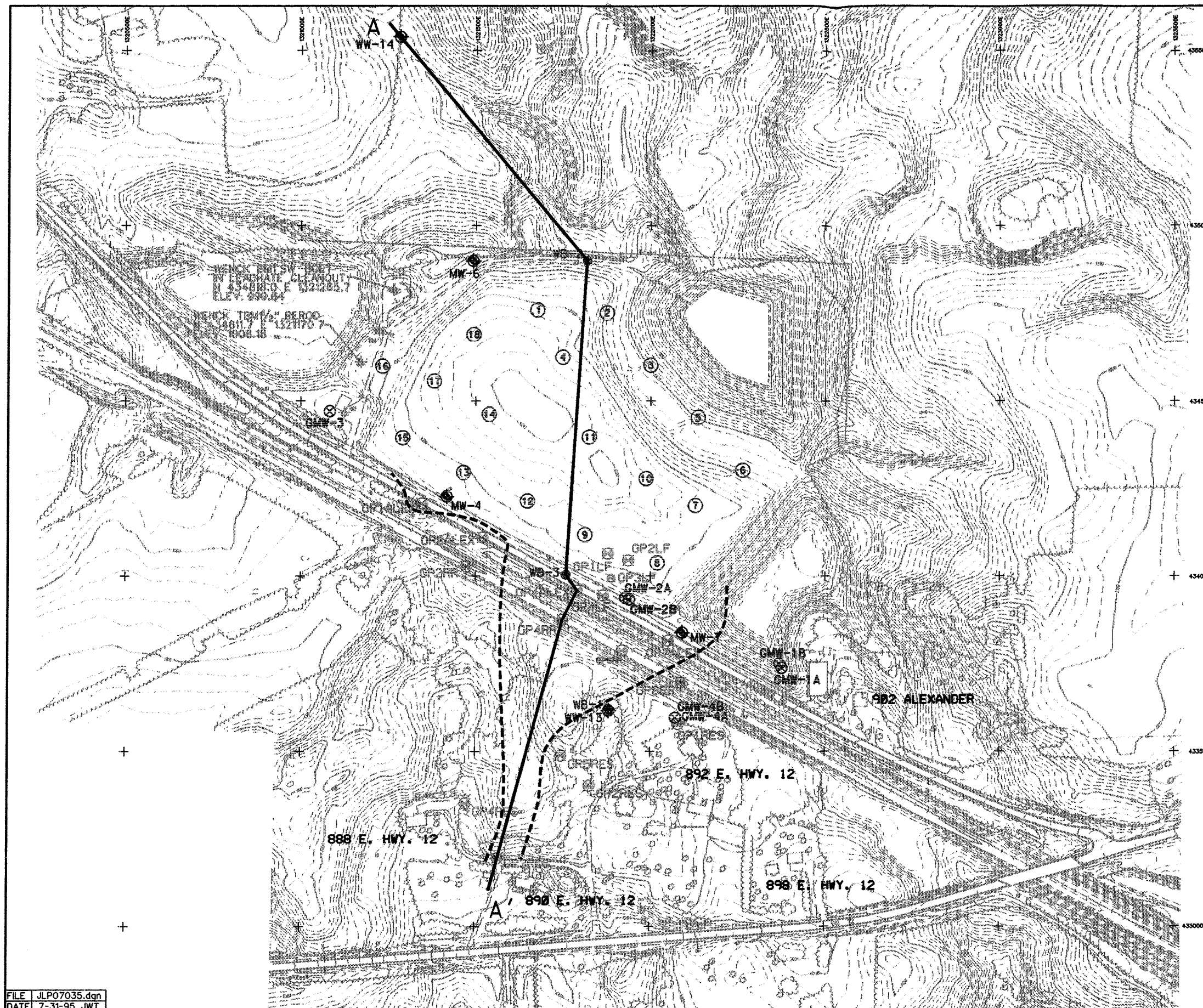
JUNKER LANDFILL
 Geologic Cross-Section B-B'

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Figure 3-2



LEGEND

- RAILROAD TRACKS
- ROAD
- FENCE
- WOODS OUTLINE
- INDEX CONTOUR
- INTERMEDIATE CONTOUR
- APPROXIMATE CONTOUR
- CULVERT
- SPOT ELEVATION
- END OF CULVERT
- UTILITY POLE
- TREE
- CONTROL POINT
- MONITORING WELL
EXISTING PRIOR TO WINTER 1995
NEW WINTER 1995
- GAS MONITORING WELL
- GAS EXTRACTION WELL
- GEOPROBE
- SOIL BORING
- INFERRED LIMITS OF
GAS MIGRATION DETECTION
AT OR ABOVE 25% OF LEL FOR
METHANE (0.25% BY VOLUME)
- HOUSES WITH METHANE MONITORS

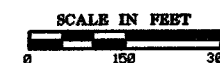
NOTE:

APPROXIMATE HORIZONTAL LIMITS OF GAS MIGRATION BASED ON TOTAL VERTICAL DETECTIONS (I.E. NOT ELEVATION SPECIFIC).

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GP3RES AND GP4RES REMAIN IN PLACE. ALL OTHER GEOPROBES HAVE BEEN ABANDONED.



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DATE 7-31-95 JMT

JUNKER LANDFILL

Horizontal Extent of Landfill Gas Migration

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Figure 2-10

| System | Rock Unit | Approx. thickness (in feet) | General Description | Graphic Column | Water - Bearing Characteristics |
|------------|---|-----------------------------|--|----------------|--|
| Quaternary | Undifferentiated glacial deposits | 0-500 | Glacial till, outwash, and valley train sand and gravel, lake deposits, and alluvium of several ages and several provenances; vertical and horizontal distribution of units is complex | | Distribution of aquifers and confining beds is poorly known; sand and gravel aquifers that yield moderate to large amounts of water are common in buried bedrock valleys |
| Ordovician | Decorah Shale | 90 | Shale, greenish-gray, fissile to blocky; includes thin discontinuous lenses of fossiliferous limestone that increase in abundance upward | | Aquifer: Low yields from fractures in shale and solution cavities in dolostone |
| | Platteville Formation | to 35 | Dolostone, light-gray, buff, thin- to med-bedded, shaly | | Confining bed |
| | Glenwood Formation | to 5 | Shale, greenish-gray, fissile, sandy | | Aquifer: moderate yields |
| | St. Peter Sandstone | 150 | Sandstone, light-gray, massively bedded, well sorted, med-gr., poorly cemented, quartzose; approx. 20-ft.-thick silty to shaly bed near base | | Confining bed |
| | Shakopee Formation | 50 | Dolostone, buff, thin- to thick-bedded, silt- and sand-rich, med-gr., thin sandstone beds near base | | Aquifer: high yields from fractures in dolostone and from poorly cemented sandstone; principal aquifer of the Twin City basin |
| | Onondaga Dolomite | 100 | Dolostone, buff, thin- to thick-bedded, vuggy, med-gr., silt-size dolomite matrix | | |
| Cambrian | Jordan Sandstone | 90 | Sandstone, light-gray, massively bedded, med- to coarse-gr., well sorted, poorly cemented, quartzose | | Confining bed |
| | St. Lawrence Formation | 50 | Dolostone, gray to tan, silty or sandy, argillaceous; glauconitic in upper part | | Aquifer: low yields |
| | Francenia Formation | 155 | Sandstone, greenish-gray, thin-bedded, fine- to coarse-gr., silty to dolomitic, commonly glauconitic; an upper aquifer (Reno) is a fine-gr. sandstone | | Confining bed |
| | Ironton Sandstone | 30 | Sandstone, light-gray, poorly to well sorted, med-gr., silt-rich, quartzose | | Aquifer: moderate to high yields |
| | Galesville Sandstone | 35 | Sandstone, light-gray, well sorted, fine- to med-gr., quartzose | | |
| | Eau Claire Formation | to 130 | Sandstone, red, fine- to med-gr., silty, glauconitic; interbedded with grayish-green to red, fissile shale | | Confining bed |
| | Mt. Simon Sandstone | 160 | Sandstone, light-gray, fine- to coarse-gr., quartzose; thin shale beds in upper part | | Aquifer: moderate to high yields; second most important aquifer of Twin City basin |
| Keweenaw | Hinckley Sandstone | 75 | Sandstone, tan, med- to coarse-gr., arkosic | | Confining bed |
| | Fond du Lac Formation and older sedimentary rocks | to 4,000 | Sandstone and siltstone, fine-gr., well cemented, arkosic; interbedded with red to green micaceous shale | | |
| | Metamorphic and Igneous Rocks | to 20,000 | Mostly mafic, lava flows with thin interflow sediments | | |

Source: Geology of Minnesota: A Centennial Volume, 1972.

JUNKER LANDFILL

Water-Bearing Characteristics of Geologic Units, Twin Cities Basin
Junker Landfill - Hudson Township, Wisconsin

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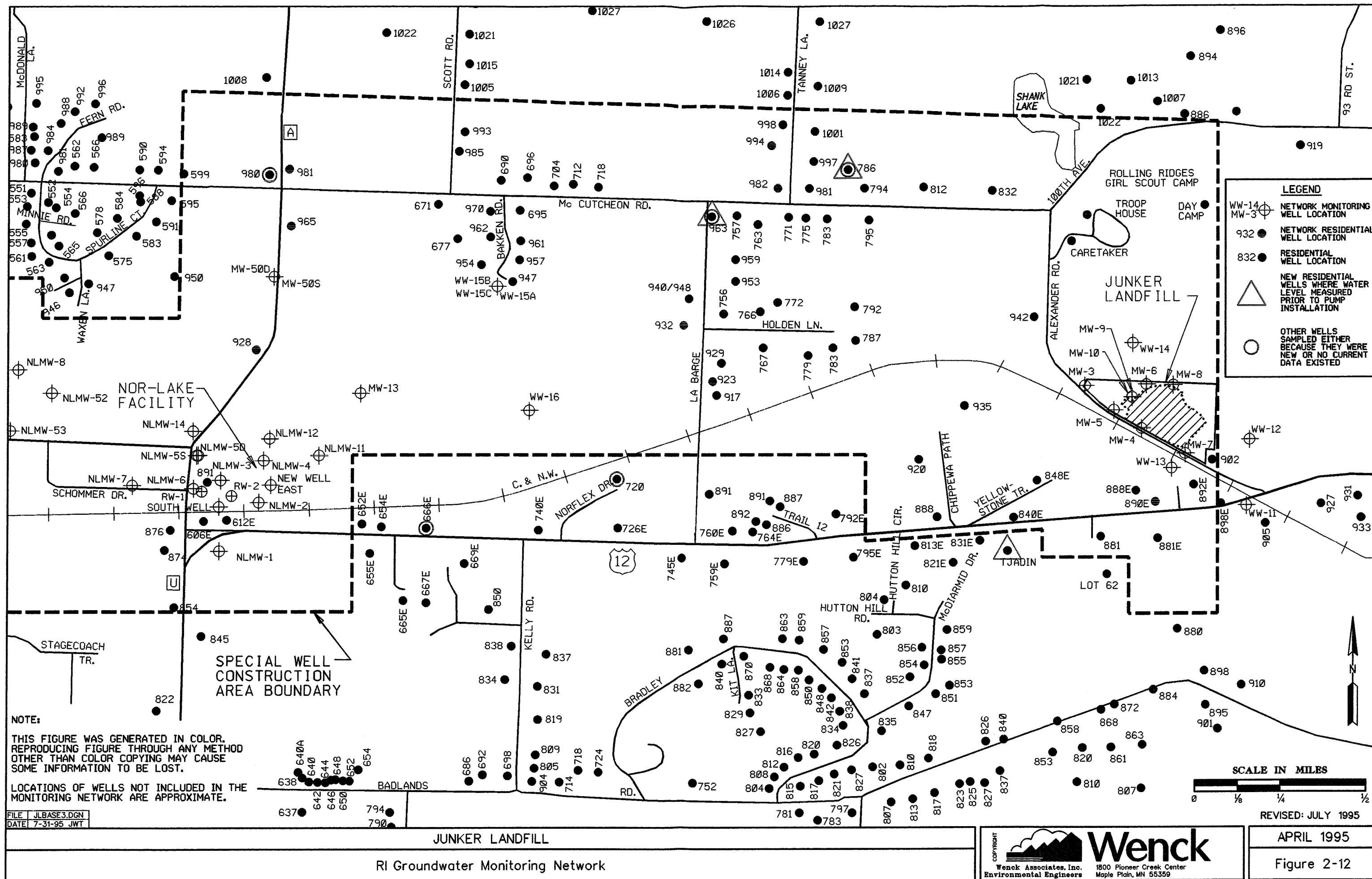
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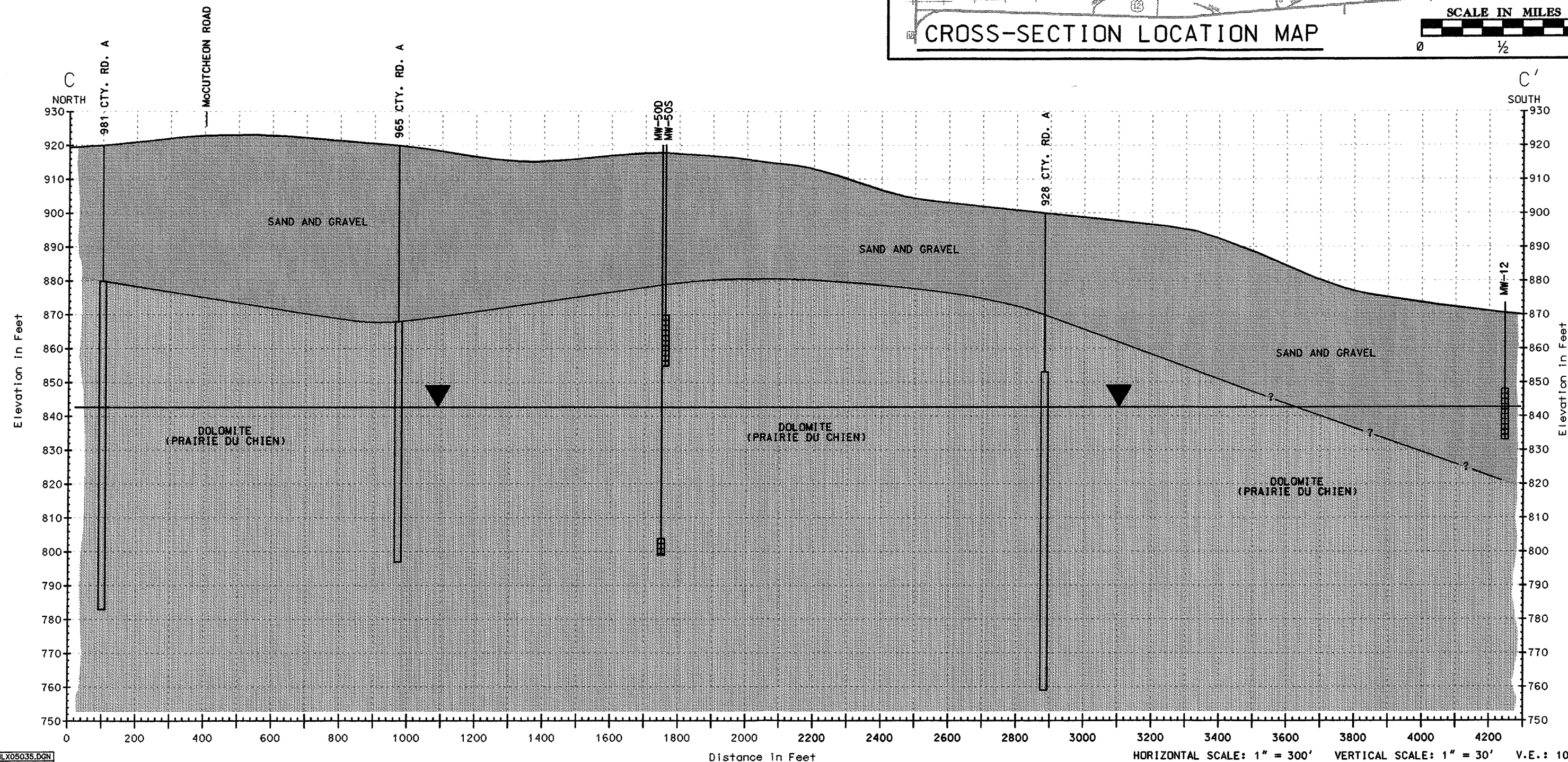
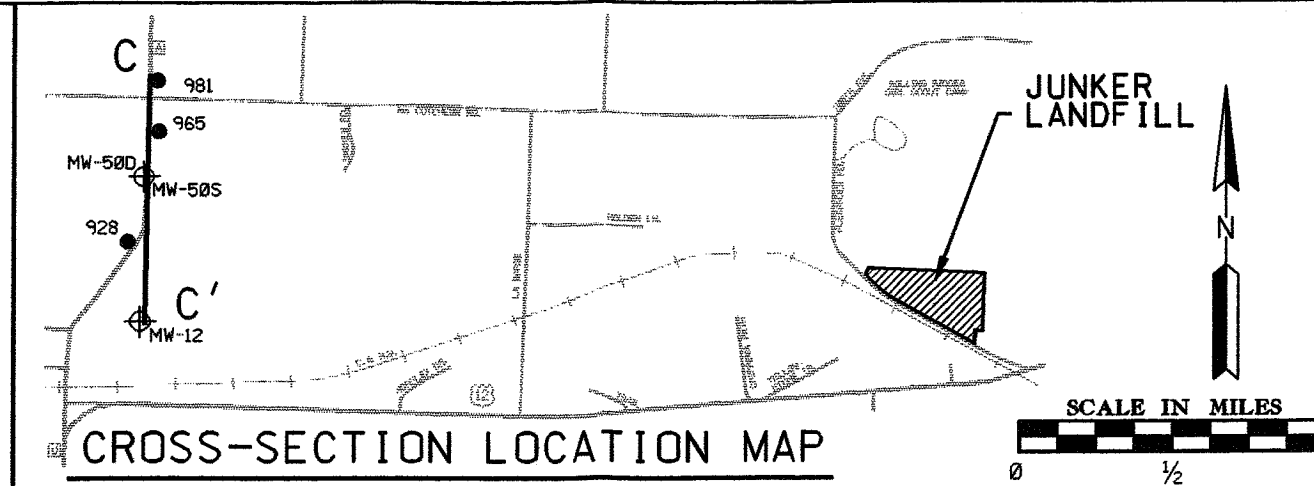
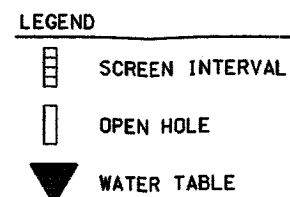
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Figure 3-1



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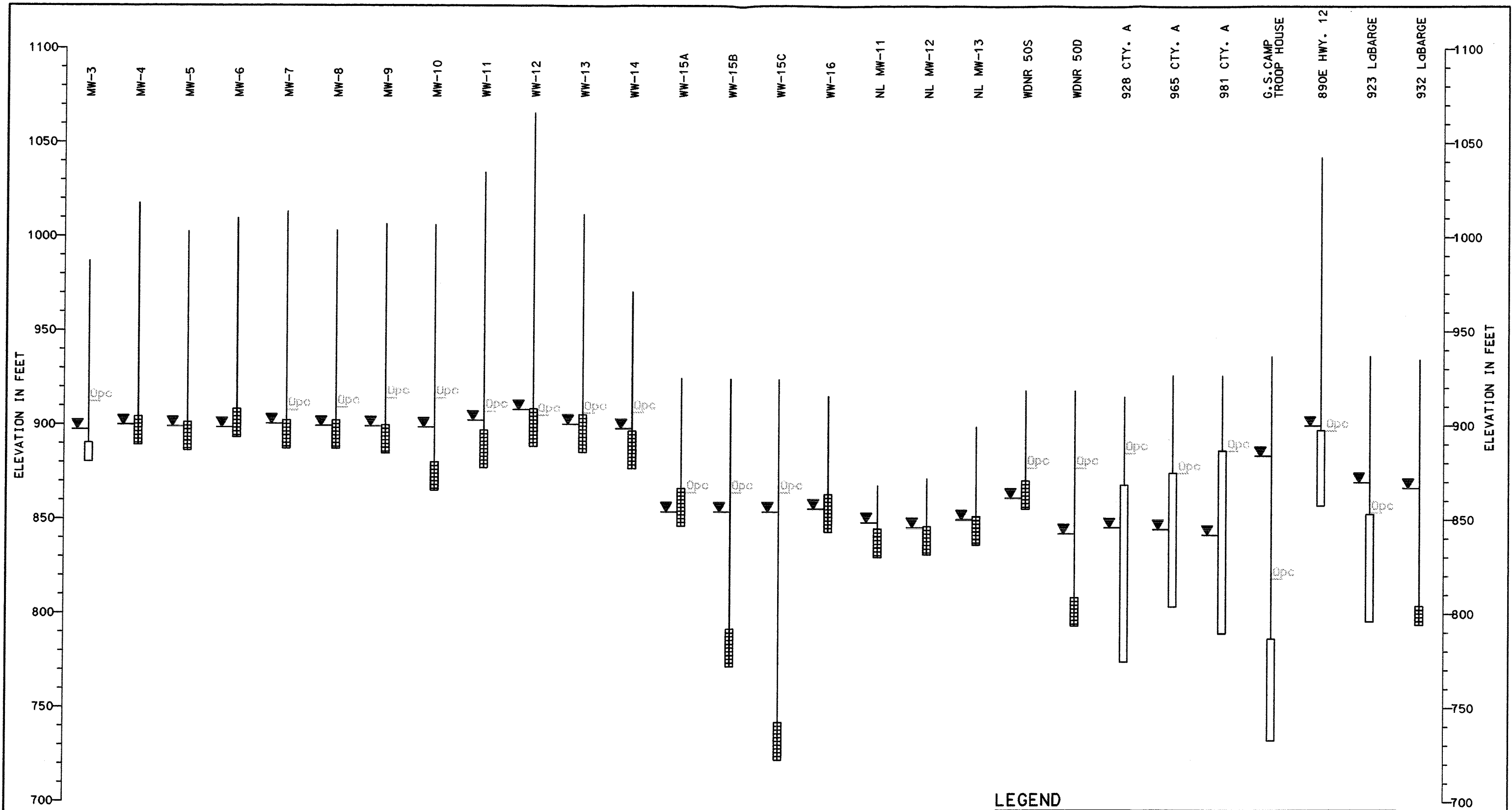


FILE: JLN05035.DGN
DATE: 4-7-95 JMT

JUNKER LANDFILL
Geologic Cross Section C-C'

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Figure 3-3



FILE JLX17035.DGN
DATE 7-31-95 JWT

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LEGEND

- PRAIRIE DU CHIEN
- WELL SCREEN
- GROUNDWATER ELEVATION
- OPEN HOLE

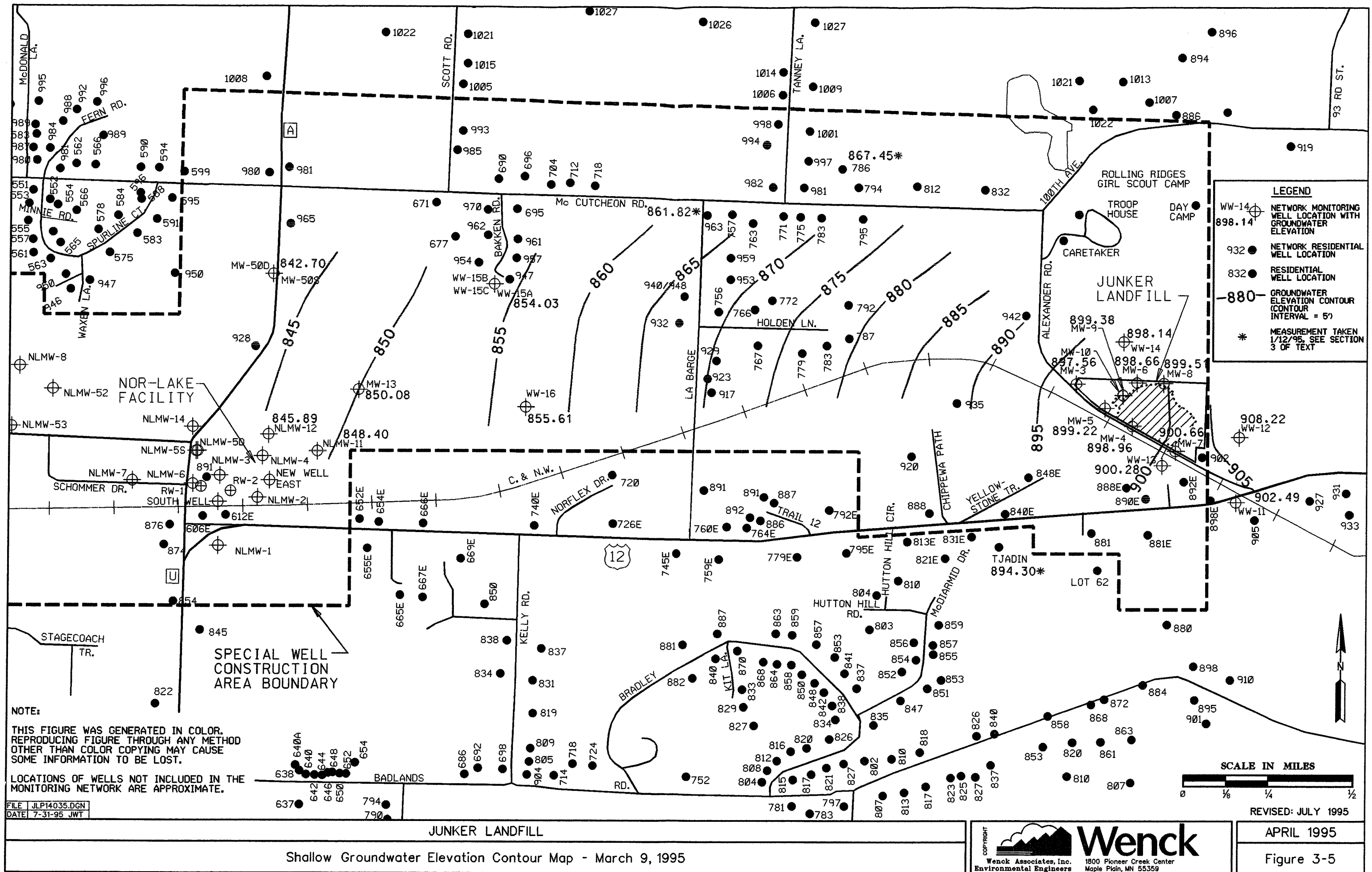
NOTE:
GROUNDWATER ELEVATIONS AT RESIDENTIAL WELLS ARE INFERRED.

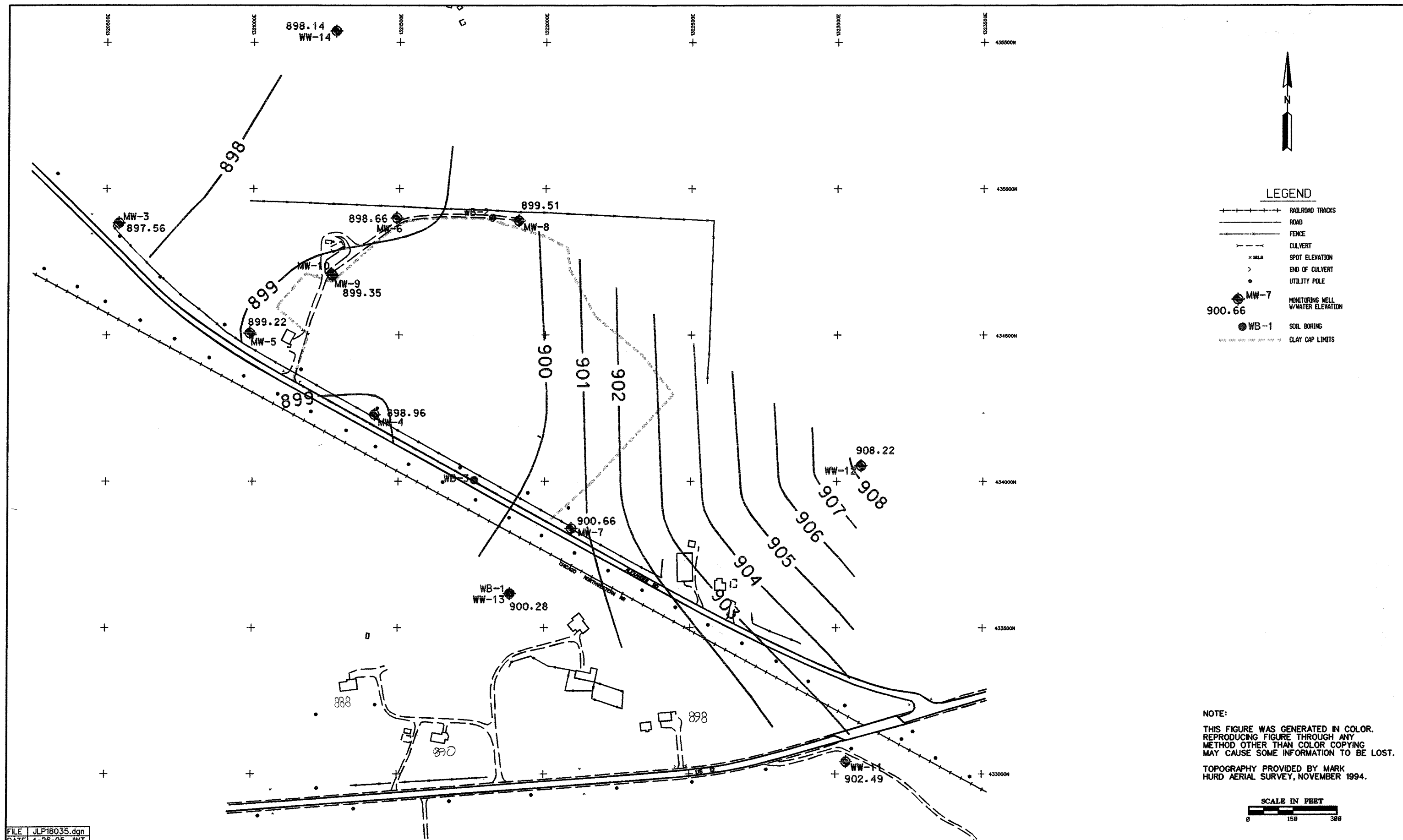
JUNKER LANDFILL
Well Screen Diagram

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Figure 3-4





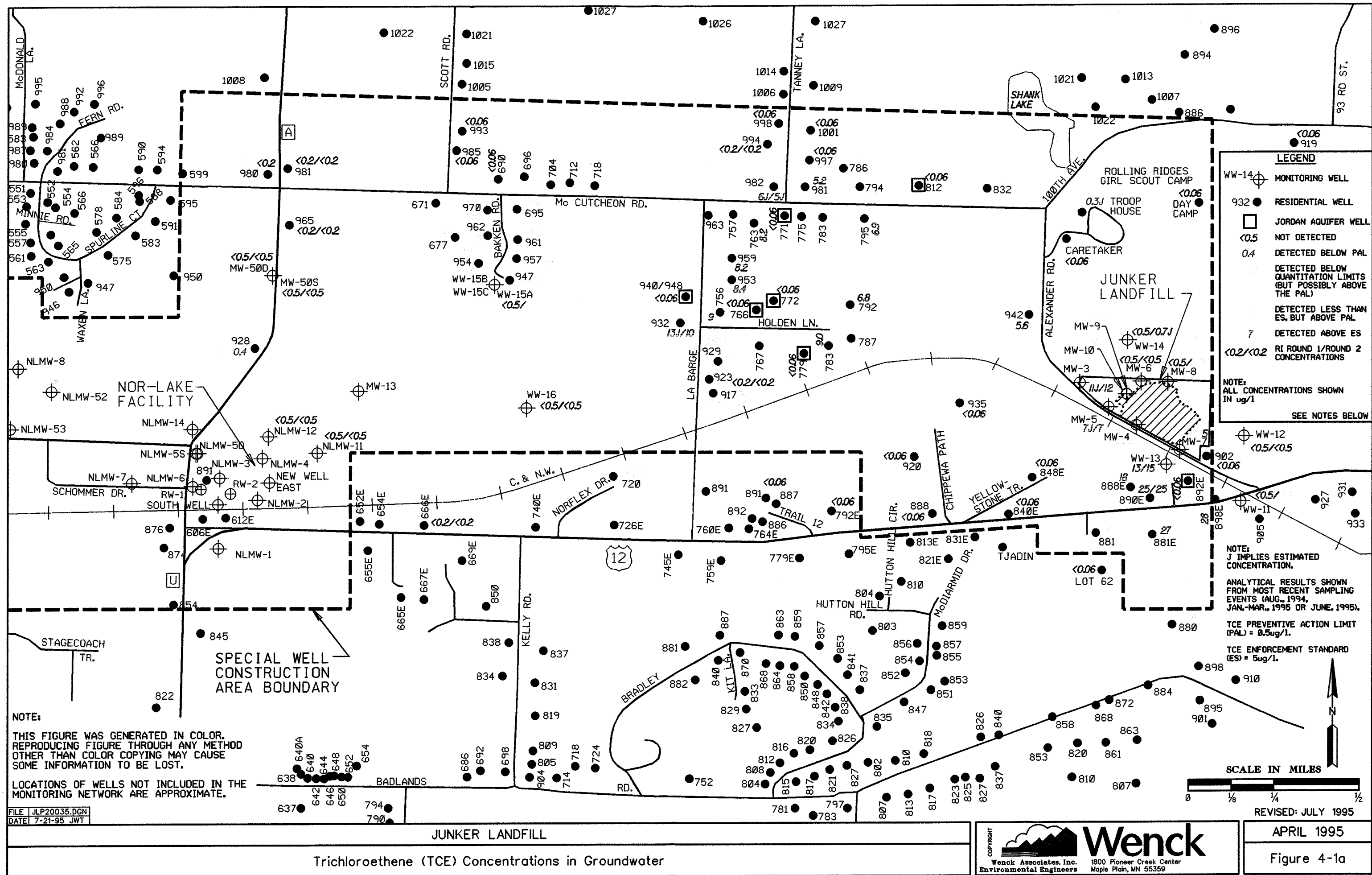
FILE JLP18035.dgn
DATE 4-26-95 JWT

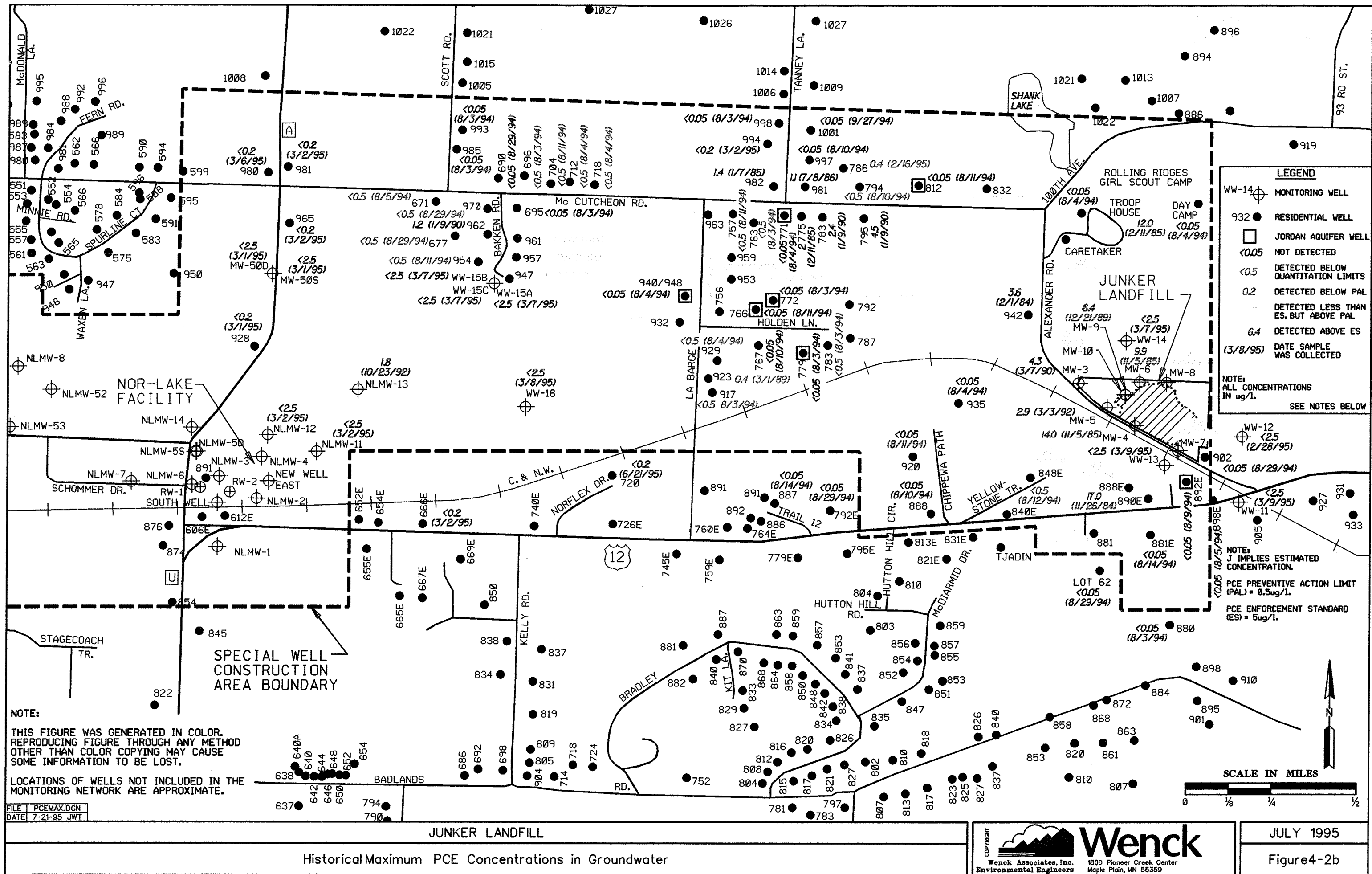
JUNKER LANDFILL

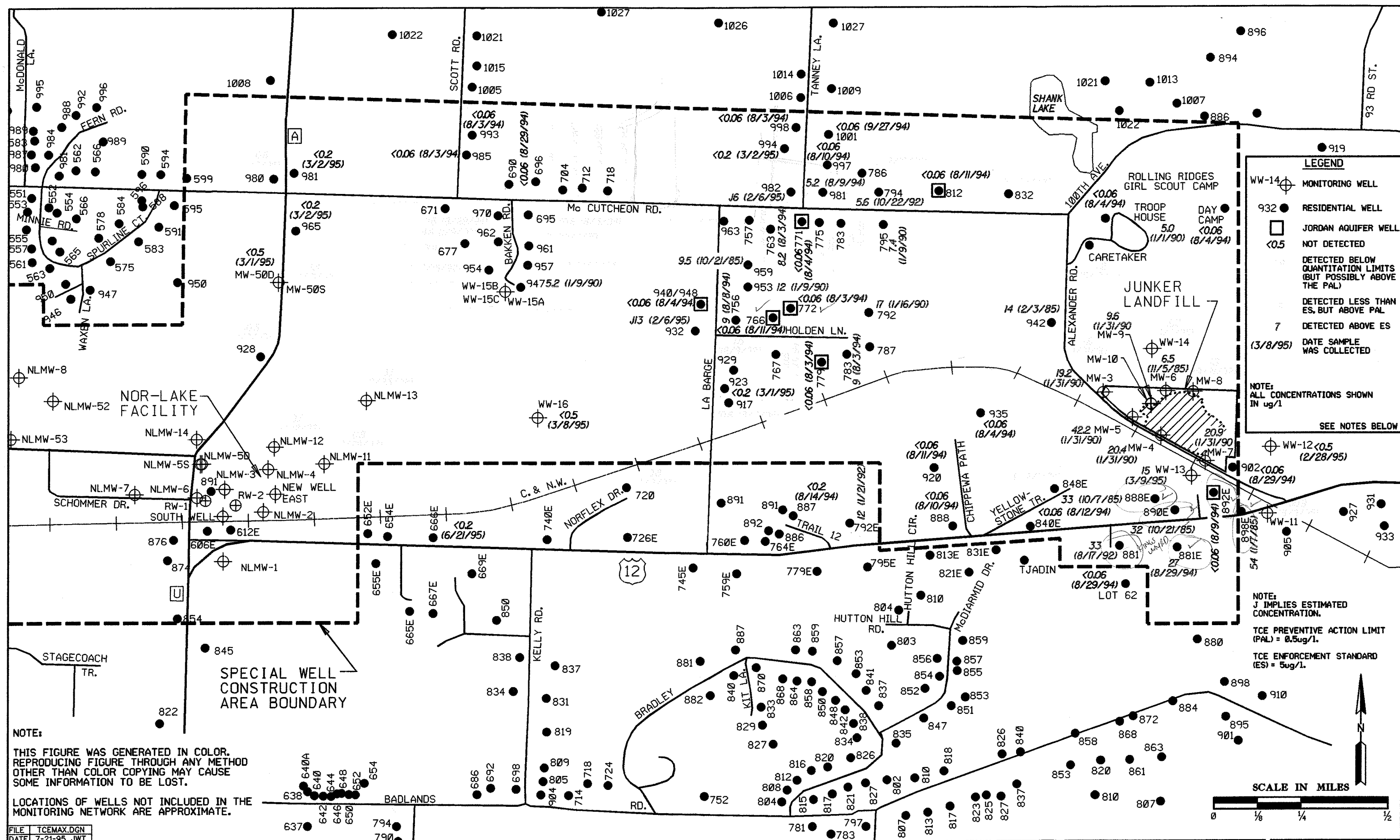
Groundwater Elevation Contour Map - Landfill Vicinity (March 9, 1995)

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APRIL 1995
Figure 3-6







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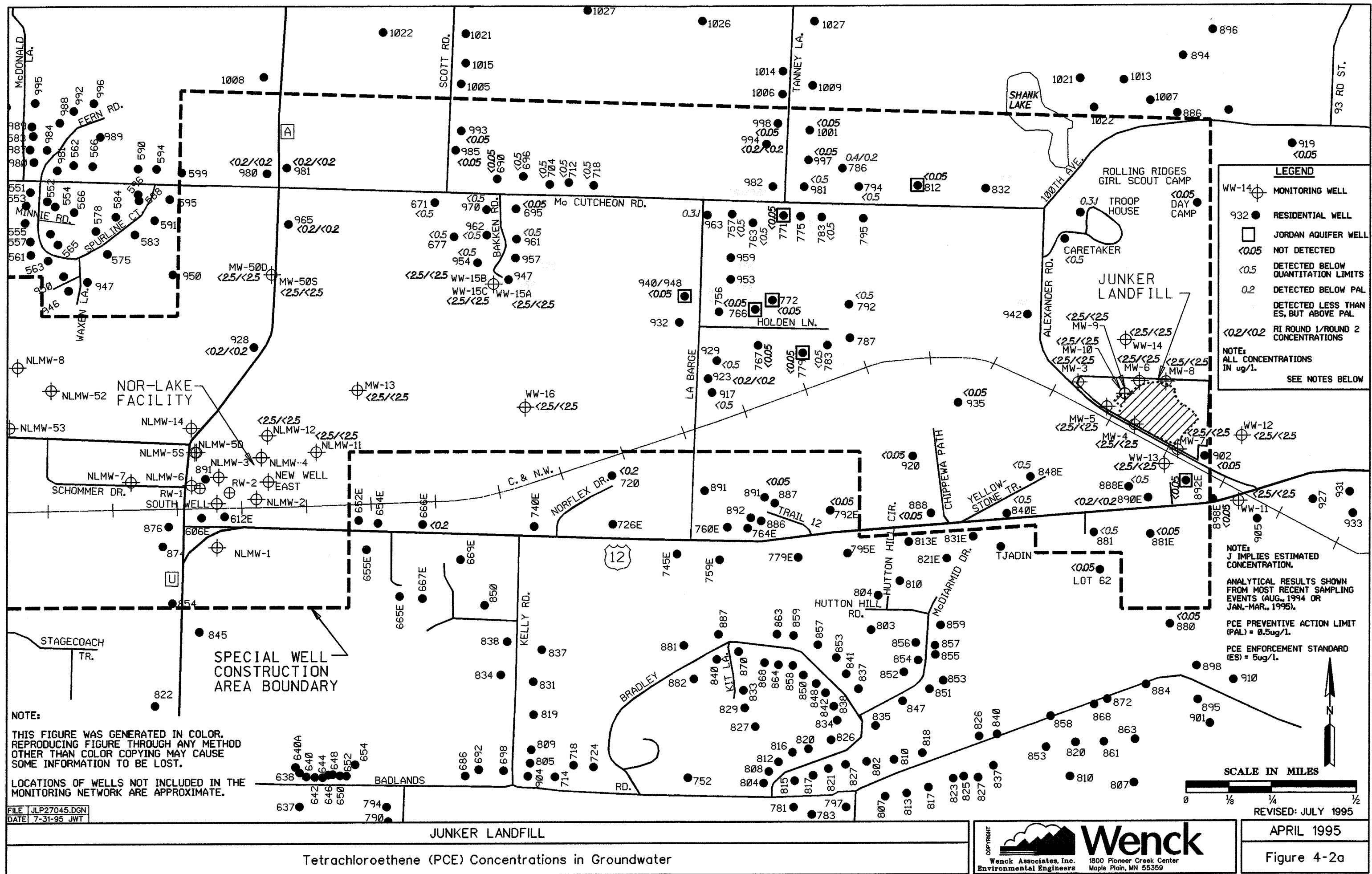
LOCATIONS OF WELLS NOT INCLUDED IN THE
MONITORING NETWORK ARE APPROXIMATE.

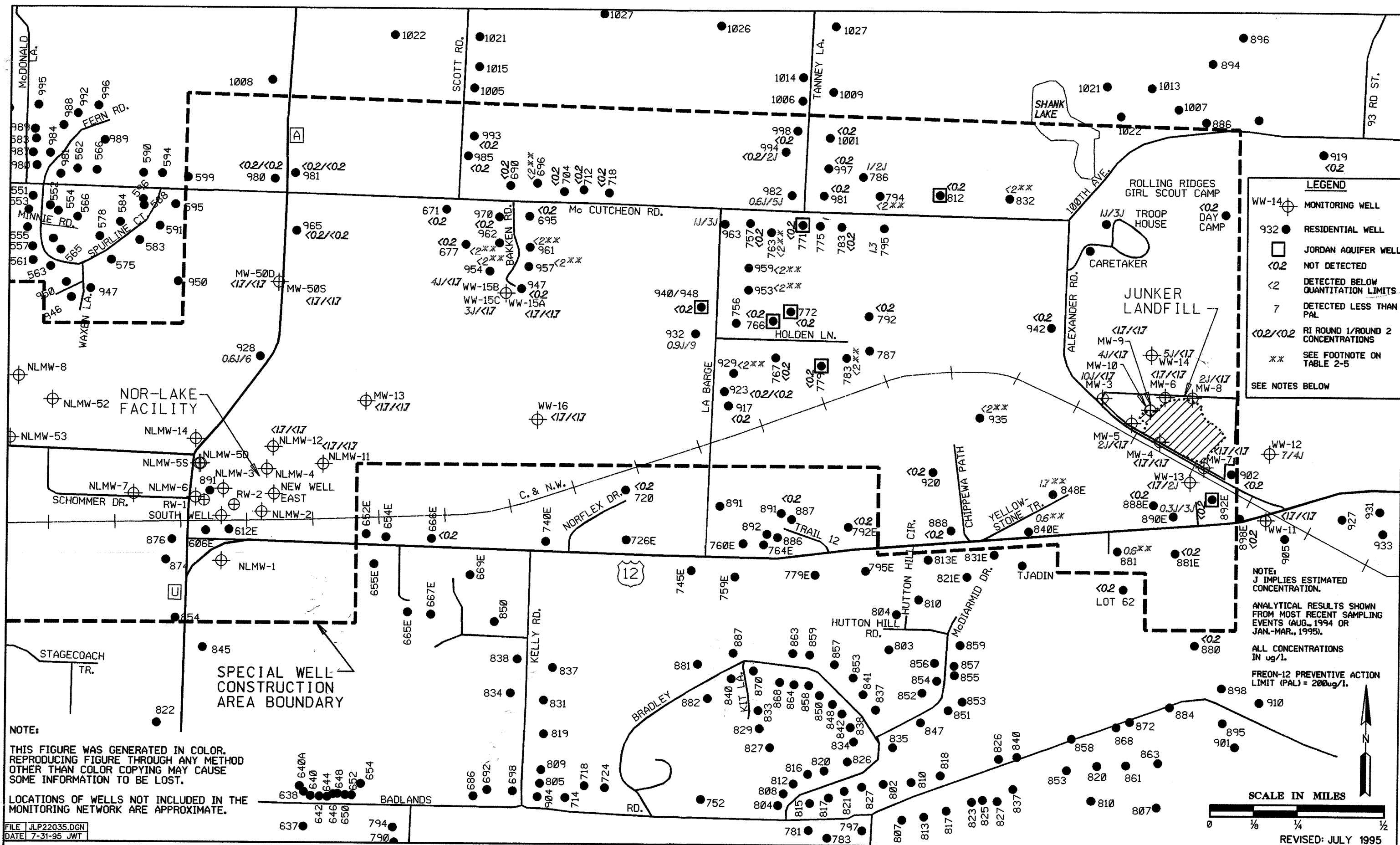
FILE TCEMAX.DGN
DATE 7-21-95 JWT

JUNKER LANDFILL
Historical Maximum TCE Concentrations in Groundwater

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Environmental Engineers Maple Plain, MN 55359

JULY 1995
Figure 4-1b





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LOCATIONS OF WELLS NOT INCLUDED IN THE
MONITORING NETWORK ARE APPROXIMATE.

FILE JLP22035.DGN
DATE 7-31-95 JWT

LEGEND

- MW-14 MONITORING WELL
- 932 RESIDENTIAL WELL
- JORDAN AQUIFER WELL
- <0.2 NOT DETECTED
- <2 DETECTED BELOW QUANTITATION LIMITS
- 7 DETECTED LESS THAN PAL
- <0.2/<0.2 RI ROUND 1/ROUND 2 CONCENTRATIONS
- ** SEE FOOTNOTE ON TABLE 2-5

SEE NOTES BELOW

NOTE:
J IMPLIES ESTIMATED CONCENTRATION.

ANALYTICAL RESULTS SHOWN FROM MOST RECENT SAMPLING EVENTS (AUG., 1994 OR JAN.-MAR., 1995).

ALL CONCENTRATIONS IN ug/L.

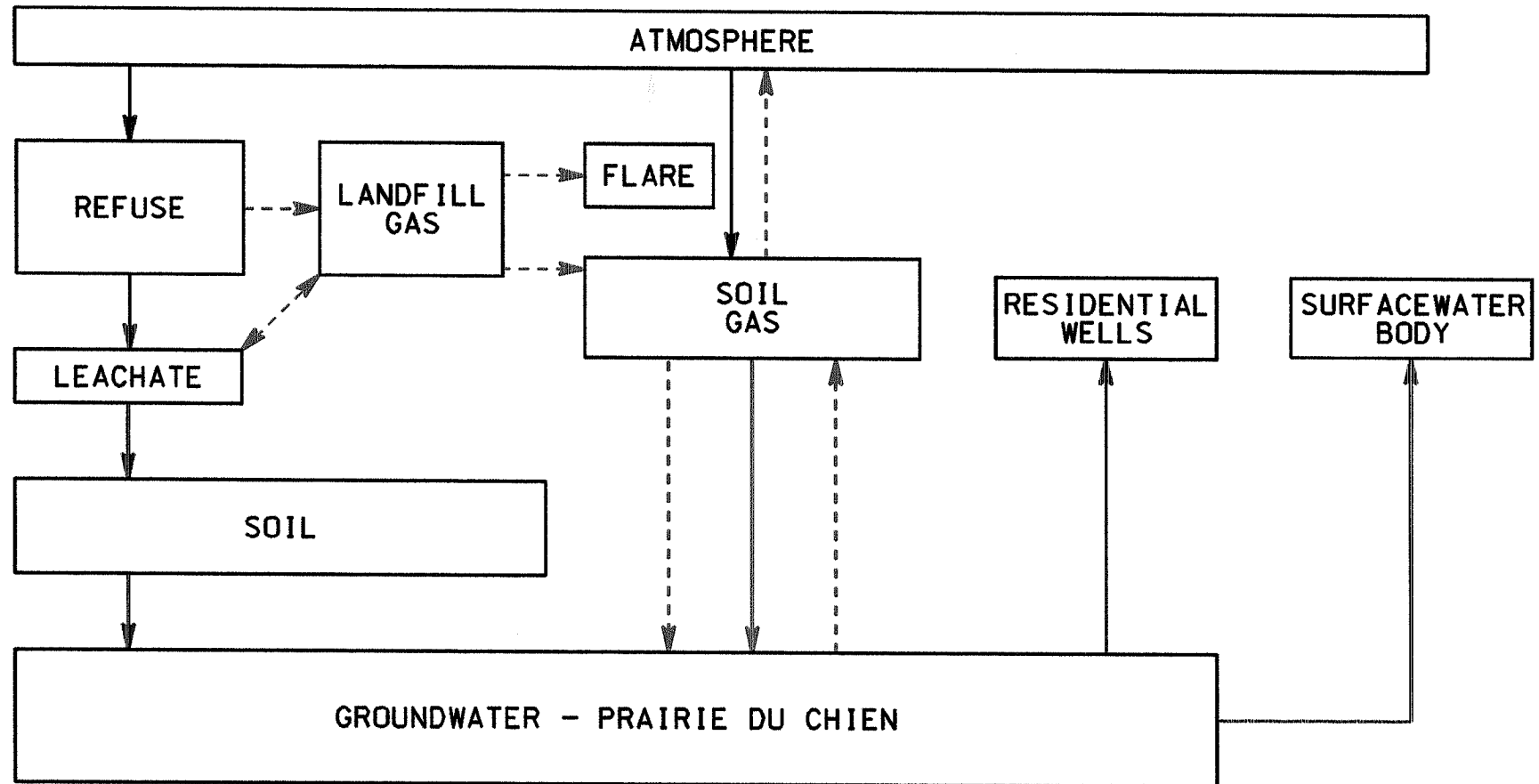
FREON-12 PREVENTIVE ACTION LIMIT (PAL) = 200ug/L.

SCALE IN MILES
0 1/8 1/4 1/2

REVISED: JULY 1995

Dichlorodifluoromethane (Freon-12) Concentrations in Groundwater

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LEGEND

- RAIN/INFILTRATION
- CONTAMINATED WATER (VOCs, SVOCs, METALS)
- - - - - VOC-LADEN GAS
- TREATED GAS
- VOC-CONTAMINATED WATER

FILE JLP26045.DGN
DATE 7-31-95 JWT

JUNKER LANDFILL

Contaminant Migration Routes

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Figure 5-1

Appendix L

Slug Testing

Slug Testing

Slug Testing Techniques

Slug tests were performed on WW-12 and WW-15A. A slug test consists of displacing a volume of water in a well and monitoring the recovery of the aquifer to the pre-stressed condition. The insertion or removal of a slug tool from a well is equivalent to displacing an equal volume of water. By monitoring the transient water level in the wells, it was possible to estimate the hydraulic conductivity (from hereon referred to as conductivity) immediately surrounding the gravel packs.

The slug tool used to displace water in the monitoring wells was a nominal 1-inch x 48-inch steel pipe filled with gravel. This water-tight assembly displaced roughly 2 feet of water in the 2-inch monitoring wells. The time required for the well to dissipate the water and return to the initial static level was measured with a 20-psi In-Situ pressure transducer and recorded with a Hermit 2000 datalogger at a very high frequency during the initial stages of the test and at a coarser frequency as the water level in the well approached steady-state.

The pressure transducer was set at a depth greater than the slug was lowered, taking care not to set the transducer on the bottom of the well. The transducer was secured in place (using tape, hose clamps, twine ... etc.) with care being taken not to pinch the lead to the pressure transducer. Once in place, the pressure transducer was checked via monitoring the water column readings above the transducer on the Hermit Datalogger as the transducer was raised and lowered. Prior to insertion of the slug, measurements were taken of the water column in the well to ensure the water level was at equilibrium. The decontaminated slug was submerged into the water as quickly as possible, without dropping. After the well had dissipated at least 95 percent of the water deflected, the slug was removed from the well as quickly as it was submerged. The Hermit Datalogger was set up to record water levels during the recovery phase of the test at the same schedule as during the dissipation phase. The test was recorded. The test was considered complete after the water in the well had recovered to at least 95 percent of its prestressed level. Attachment A includes the measured data.

Slug Testing Interpretative Techniques

Conductivity can be expressed as a function of time and head through the Bouwer and Rice Slug Test interpretive method (Bouwer, 1989). This method is valid for fully or partially penetrating wells in an unconfined aquifer, such as WW-12 and WW-15A. It is a semi-empirical relationship based on the conservation of mass. The method incorporates empirical relationships between the well geometry and groundwater flow, determined using electric analog models.

This method assumes that the aquifer is locally homogenous and horizontally isotropic with respect to conductivity, that groundwater flow is laminar, and that there is no resistance to flow in the vertical direction. It also assumes that the change in head due to the slug is much less than the saturated thickness of the aquifer. Conductivity can be calculated with the use of Equation 1.

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L} \frac{1}{t} \ln\left(\frac{Y_o}{Y_t}\right)$$

Where : K = hydraulic conductivity (l/t)

r_c = radius of casing (l)

r_w = radius of screened section plus gravel pack (l)

Y_o = static head (l)

Y_t = head at time t (l)

R_e = effective distance over which Y is dissipated (l)

L = length of screened section (l)

(1)

The monitoring well dimensions are given in Table II-6. The term $1/t \cdot \ln(Y_o/Y_t)$ in Equation 1 is the slope of a line regressed on the straight portion of the data as plotted on semi-logarithmic paper. Refer to the figures in Attachment A. R_e is determined using the empirical relationships as discussed in Bouwer (1989).

Note that the ~~assumed~~ conductivity of the sand pack is assumed to be on the same order as the formation ~~conductivity~~ the rate of the ~~water~~

Figures in Attachment A graphically show the dissipation or recovery of the water displaced in the monitoring wells. The average values determined from the slug test data using the Bouwer and Rice Slug Test are given in Table 2-6.

REFERENCES

Bouwer, H., *"The Bouwer and Rice Slug Test-An Update"*, Ground Water, 1989. v.27, n.3, pp.304-309.

Kitanidis, P.K., and Vomvoris, E.G., *"A Geostatistical Approach to the Inverse Problem in Groundwater Modeling (Steady-State and One-Dimensional Simulations)"*, Water Resources Research, 1983. v.19, n.3, pp. 677-690.

| |
|--|
| APPENDIX L |
| |
| Attachment A |
| <i>Slug Test Data and Plots</i> |

Le = 235.2 (in)
r = 1 R = 5 (in)

K(ft/day) = 10.1
LN(Re/rw) = 2.242253

1.843909

Lw = 235.2 (in)
A = 3.9
B = 0.6
H = 2400 (in)

Regression Output:

Constant -0.7140849
Std Err of Y Est 0.148277389
R Squared 0.423544446
No. of Observations 65
Degrees of Freedom 63

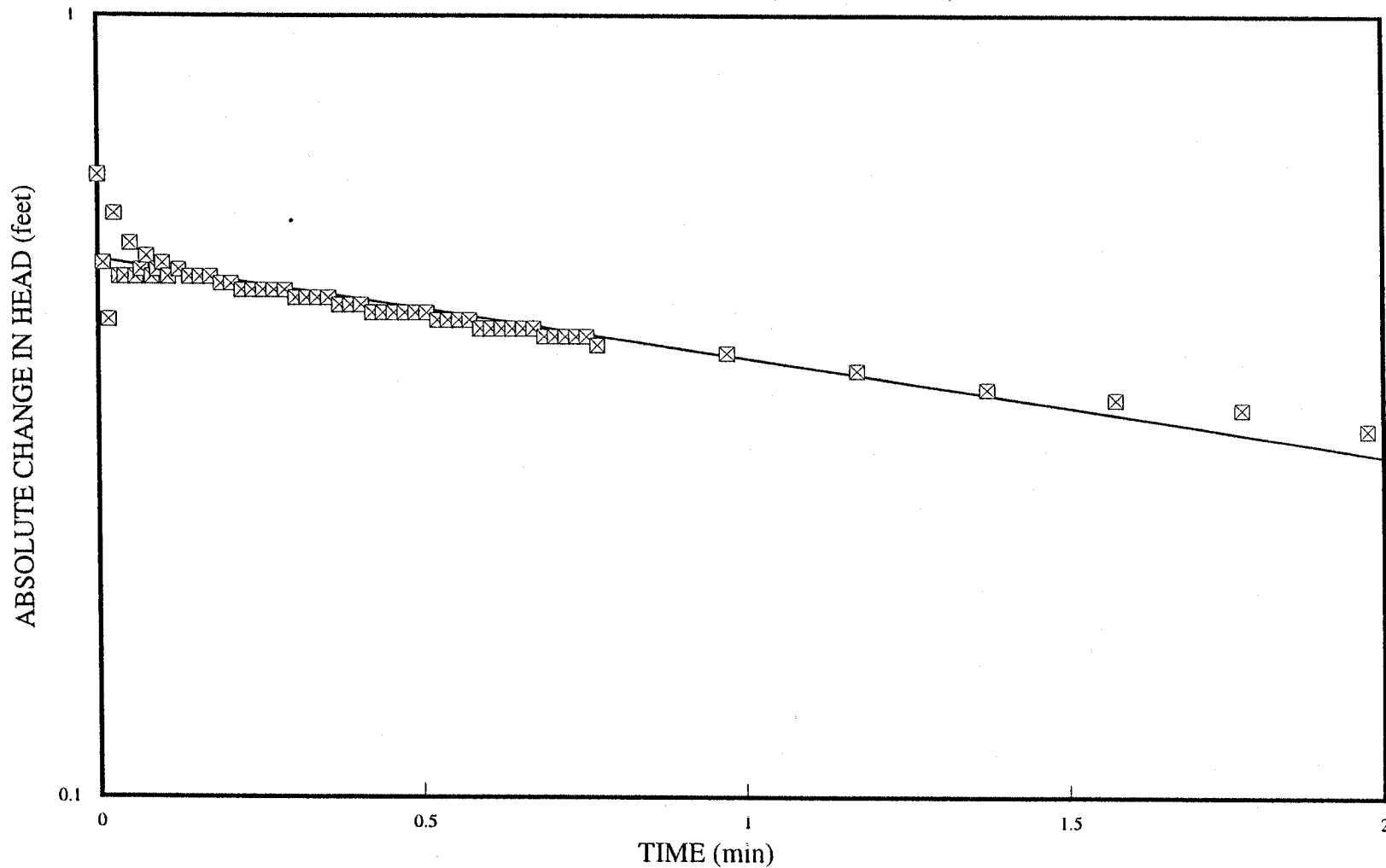
X Coefficient(s) -0.29389
Std Err of Coef. 0.043197

| TIME (min) | HEAD(FT) | Delta Phi | abs(dphi) | REG-LINE | X | ln(dPHI) |
|------------|----------|-----------|-----------|----------|---------|----------|
| 0 | -0.009 | -0.066 | 0.066 | 0.523112 | -0.225 | -2.7181 |
| 0.0083 | -0.009 | -0.066 | 0.066 | 0.521838 | -0.2167 | -2.7181 |
| 0.0166 | -0.009 | -0.066 | 0.066 | 0.520567 | -0.2084 | -2.7181 |
| 0.025 | -0.009 | -0.066 | 0.066 | 0.519283 | -0.2 | -2.7181 |
| 0.0333 | -0.009 | -0.066 | 0.066 | 0.518018 | -0.1917 | -2.7181 |
| 0.0416 | -0.009 | -0.066 | 0.066 | 0.516756 | -0.1834 | -2.7181 |
| 0.05 | -0.009 | -0.066 | 0.066 | 0.515482 | -0.175 | -2.7181 |
| 0.0583 | -0.009 | -0.066 | 0.066 | 0.514226 | -0.1667 | -2.7181 |
| 0.0666 | -0.009 | -0.066 | 0.066 | 0.512973 | -0.1584 | -2.7181 |
| 0.075 | -0.009 | -0.066 | 0.066 | 0.511708 | -0.15 | -2.7181 |
| 0.0833 | -0.009 | -0.066 | 0.066 | 0.510461 | -0.1417 | -2.7181 |
| 0.0916 | -0.018 | -0.057 | 0.057 | 0.509218 | -0.1334 | -2.8647 |
| 0.1 | -0.028 | -0.047 | 0.047 | 0.507962 | -0.125 | -3.05761 |
| 0.1083 | -0.037 | -0.038 | 0.038 | 0.506725 | -0.1167 | -3.27017 |
| 0.1166 | -4.787 | 4.712 | 4.712 | 0.50549 | -0.1084 | 1.550112 |
| 0.1333 | -2.539 | 2.464 | 2.464 | 0.503015 | -0.0917 | 0.901786 |
| 0.1416 | -1.506 | 1.431 | 1.431 | 0.50179 | -0.0834 | 0.358374 |
| 0.15 | -0.918 | 0.843 | 0.843 | 0.500552 | -0.075 | -0.17079 |
| 0.1583 | -2.188 | 2.113 | 2.113 | 0.499333 | -0.0667 | 0.748109 |
| 0.1666 | -0.966 | 0.891 | 0.891 | 0.498116 | -0.0584 | -0.11541 |
| 0.175 | -0.691 | 0.616 | 0.616 | 0.496888 | -0.05 | -0.48451 |
| 0.1916 | -0.606 | 0.531 | 0.531 | 0.49447 | -0.0334 | -0.63299 |
| 0.2 | -1.307 | 1.232 | 1.232 | 0.493251 | -0.025 | 0.208639 |
| 0.2083 | -0.445 | 0.37 | 0.37 | 0.492049 | -0.0167 | -0.99425 |
| 0.2166 | -0.369 | 0.294 | 0.294 | 0.49085 | -0.0084 | -1.22418 |
| 0.225 | -0.701 | 0.626 | 0.626 | 0.48964 | 0 | -0.4684 |
| 0.2333 | -0.558 | 0.483 | 0.483 | 0.488447 | 0.0083 | -0.72774 |
| 0.2416 | -0.483 | 0.408 | 0.408 | 0.487257 | 0.0166 | -0.89649 |
| 0.25 | -0.634 | 0.559 | 0.559 | 0.486056 | 0.025 | -0.58161 |
| 0.2583 | -0.539 | 0.464 | 0.464 | 0.484871 | 0.0333 | -0.76787 |
| 0.2666 | -0.539 | 0.464 | 0.464 | 0.48369 | 0.0416 | -0.76787 |
| 0.275 | -0.587 | 0.512 | 0.512 | 0.482497 | 0.05 | -0.66943 |
| 0.2833 | -0.539 | 0.464 | 0.464 | 0.481322 | 0.0583 | -0.76787 |
| 0.2916 | -0.549 | 0.474 | 0.474 | 0.480149 | 0.0666 | -0.74655 |
| 0.3 | -0.568 | 0.493 | 0.493 | 0.478965 | 0.075 | -0.70725 |
| 0.3083 | -0.539 | 0.464 | 0.464 | 0.477798 | 0.0833 | -0.76787 |
| 0.3166 | -0.549 | 0.474 | 0.474 | 0.476634 | 0.0916 | -0.74655 |
| 0.325 | -0.558 | 0.483 | 0.483 | 0.475459 | 0.1 | -0.72774 |
| 0.3333 | -0.539 | 0.464 | 0.464 | 0.474301 | 0.1083 | -0.76787 |
| 0.35 | -0.549 | 0.474 | 0.474 | 0.471979 | 0.125 | -0.74655 |
| 0.3666 | -0.539 | 0.464 | 0.464 | 0.469682 | 0.1416 | -0.76787 |
| 0.3833 | -0.539 | 0.464 | 0.464 | 0.467382 | 0.1583 | -0.76787 |
| 0.4 | -0.539 | 0.464 | 0.464 | 0.465094 | 0.175 | -0.76787 |
| 0.4166 | -0.53 | 0.455 | 0.455 | 0.46283 | 0.1916 | -0.78746 |
| 0.4333 | -0.53 | 0.455 | 0.455 | 0.460564 | 0.2083 | -0.78746 |
| 0.45 | -0.521 | 0.446 | 0.446 | 0.458309 | 0.225 | -0.80744 |
| 0.4666 | -0.521 | 0.446 | 0.446 | 0.456079 | 0.2416 | -0.80744 |
| 0.4833 | -0.521 | 0.446 | 0.446 | 0.453846 | 0.2583 | -0.80744 |
| 0.5 | -0.521 | 0.446 | 0.446 | 0.451624 | 0.275 | -0.80744 |
| 0.5166 | -0.521 | 0.446 | 0.446 | 0.449426 | 0.2916 | -0.80744 |
| 0.5333 | -0.511 | 0.436 | 0.436 | 0.447226 | 0.3083 | -0.83011 |
| 0.55 | -0.511 | 0.436 | 0.436 | 0.445036 | 0.325 | -0.83011 |

| | | | | | | |
|--------|--------|-------|-------|----------|--------|----------|
| 0.5666 | -0.511 | 0.436 | 0.436 | 0.44287 | 0.3416 | -0.83011 |
| 0.5833 | -0.511 | 0.436 | 0.436 | 0.440702 | 0.3583 | -0.83011 |
| 0.6 | -0.502 | 0.427 | 0.427 | 0.438544 | 0.375 | -0.85097 |
| 0.6166 | -0.502 | 0.427 | 0.427 | 0.43641 | 0.3916 | -0.85097 |
| 0.6333 | -0.502 | 0.427 | 0.427 | 0.434273 | 0.4083 | -0.85097 |
| 0.65 | -0.492 | 0.417 | 0.417 | 0.432147 | 0.425 | -0.87467 |
| 0.6666 | -0.492 | 0.417 | 0.417 | 0.430044 | 0.4416 | -0.87467 |
| 0.6833 | -0.492 | 0.417 | 0.417 | 0.427938 | 0.4583 | -0.87467 |
| 0.7 | -0.492 | 0.417 | 0.417 | 0.425843 | 0.475 | -0.87467 |
| 0.7166 | -0.492 | 0.417 | 0.417 | 0.423771 | 0.4916 | -0.87467 |
| 0.7333 | -0.492 | 0.417 | 0.417 | 0.421696 | 0.5083 | -0.87467 |
| 0.75 | -0.483 | 0.408 | 0.408 | 0.419631 | 0.525 | -0.89649 |
| 0.7666 | -0.483 | 0.408 | 0.408 | 0.417589 | 0.5416 | -0.89649 |
| 0.7833 | -0.483 | 0.408 | 0.408 | 0.415545 | 0.5583 | -0.89649 |
| 0.8 | -0.483 | 0.408 | 0.408 | 0.41351 | 0.575 | -0.89649 |
| 0.8166 | -0.473 | 0.398 | 0.398 | 0.411498 | 0.5916 | -0.9213 |
| 0.8333 | -0.473 | 0.398 | 0.398 | 0.409483 | 0.6083 | -0.9213 |
| 0.85 | -0.473 | 0.398 | 0.398 | 0.407478 | 0.625 | -0.9213 |
| 0.8666 | -0.473 | 0.398 | 0.398 | 0.405495 | 0.6416 | -0.9213 |
| 0.8833 | -0.473 | 0.398 | 0.398 | 0.40351 | 0.6583 | -0.9213 |
| 0.9 | -0.473 | 0.398 | 0.398 | 0.401534 | 0.675 | -0.9213 |
| 0.9166 | -0.464 | 0.389 | 0.389 | 0.39958 | 0.6916 | -0.94418 |
| 0.9333 | -0.464 | 0.389 | 0.389 | 0.397624 | 0.7083 | -0.94418 |
| 0.95 | -0.464 | 0.389 | 0.389 | 0.395677 | 0.725 | -0.94418 |
| 0.9666 | -0.464 | 0.389 | 0.389 | 0.393751 | 0.7416 | -0.94418 |
| 0.9833 | -0.464 | 0.389 | 0.389 | 0.391823 | 0.7583 | -0.94418 |
| 1 | -0.454 | 0.379 | 0.379 | 0.389905 | 0.775 | -0.97022 |
| 1.2 | -0.445 | 0.37 | 0.37 | 0.367647 | 0.975 | -0.99425 |
| 1.4 | -0.426 | 0.351 | 0.351 | 0.346661 | 1.175 | -1.04697 |
| 1.6 | -0.407 | 0.332 | 0.332 | 0.326872 | 1.375 | -1.10262 |
| 1.8 | -0.397 | 0.322 | 0.322 | 0.308212 | 1.575 | -1.1332 |
| 2 | -0.388 | 0.313 | 0.313 | 0.290618 | 1.775 | -1.16155 |
| 2.2 | -0.369 | 0.294 | 0.294 | 0.274028 | 1.975 | -1.22418 |
| 2.4 | -0.359 | 0.284 | 0.284 | 0.258386 | 2.175 | -1.25878 |
| 2.6 | -0.35 | 0.275 | 0.275 | 0.243636 | 2.375 | -1.29098 |
| 2.8 | -0.341 | 0.266 | 0.266 | 0.229728 | 2.575 | -1.32426 |
| 3 | -0.331 | 0.256 | 0.256 | 0.216614 | 2.775 | -1.36258 |
| 3.2 | -0.322 | 0.247 | 0.247 | 0.204249 | 2.975 | -1.39837 |
| 3.4 | -0.312 | 0.237 | 0.237 | 0.192589 | 3.175 | -1.4397 |
| 3.6 | -0.303 | 0.228 | 0.228 | 0.181595 | 3.375 | -1.47841 |
| 3.8 | -0.293 | 0.218 | 0.218 | 0.171229 | 3.575 | -1.52326 |
| 4 | -0.284 | 0.209 | 0.209 | 0.161455 | 3.775 | -1.56542 |
| 4.2 | -0.274 | 0.199 | 0.199 | 0.152238 | 3.975 | -1.61445 |
| 4.4 | -0.265 | 0.19 | 0.19 | 0.143548 | 4.175 | -1.66073 |
| 4.6 | -0.265 | 0.19 | 0.19 | 0.135353 | 4.375 | -1.66073 |
| 4.8 | -0.255 | 0.18 | 0.18 | 0.127627 | 4.575 | -1.7148 |
| 5 | -0.246 | 0.171 | 0.171 | 0.120341 | 4.775 | -1.76609 |
| 5.2 | -0.246 | 0.171 | 0.171 | 0.113472 | 4.975 | -1.76609 |
| 5.4 | -0.236 | 0.161 | 0.161 | 0.106994 | 5.175 | -1.82635 |
| 5.6 | -0.227 | 0.152 | 0.152 | 0.100886 | 5.375 | -1.88387 |
| 5.8 | -0.227 | 0.152 | 0.152 | 0.095127 | 5.575 | -1.88387 |
| 6 | -0.217 | 0.142 | 0.142 | 0.089697 | 5.775 | -1.95193 |
| 6.2 | -0.217 | 0.142 | 0.142 | 0.084577 | 5.975 | -1.95193 |
| 6.4 | -0.208 | 0.133 | 0.133 | 0.079749 | 6.175 | -2.01741 |
| 6.6 | -0.198 | 0.123 | 0.123 | 0.075196 | 6.375 | -2.09557 |
| 6.8 | -0.198 | 0.123 | 0.123 | 0.070904 | 6.575 | -2.09557 |
| 7 | -0.198 | 0.123 | 0.123 | 0.066856 | 6.775 | -2.09557 |
| 7.2 | -0.189 | 0.114 | 0.114 | 0.06304 | 6.975 | -2.17156 |
| 7.4 | -0.179 | 0.104 | 0.104 | 0.059441 | 7.175 | -2.26336 |
| 7.6 | -0.179 | 0.104 | 0.104 | 0.056048 | 7.375 | -2.26336 |
| 7.8 | -0.179 | 0.104 | 0.104 | 0.052849 | 7.575 | -2.26336 |
| 8 | -0.17 | 0.095 | 0.095 | 0.049832 | 7.775 | -2.35388 |
| 8.2 | -0.17 | 0.095 | 0.095 | 0.046987 | 7.975 | -2.35388 |
| 8.4 | -0.161 | 0.086 | 0.086 | 0.044305 | 8.175 | -2.45341 |
| 8.6 | -0.161 | 0.086 | 0.086 | 0.041776 | 8.375 | -2.45341 |
| 8.8 | -0.161 | 0.086 | 0.086 | 0.039391 | 8.575 | -2.45341 |
| 9 | -0.151 | 0.076 | 0.076 | 0.037142 | 8.775 | -2.57702 |
| 9.2 | -0.151 | 0.076 | 0.076 | 0.035022 | 8.975 | -2.57702 |
| 9.4 | -0.151 | 0.076 | 0.076 | 0.033023 | 9.175 | -2.57702 |
| 9.6 | -0.142 | 0.067 | 0.067 | 0.031138 | 9.375 | -2.70306 |
| 9.8 | -0.142 | 0.067 | 0.067 | 0.02936 | 9.575 | -2.70306 |
| 10 | -0.142 | 0.067 | 0.067 | 0.027684 | 9.775 | -2.70306 |
| 12 | -0.113 | 0.038 | 0.038 | 0.01538 | 11.775 | -3.27017 |
| 14 | -0.094 | 0.019 | 0.019 | 0.008545 | 13.775 | -3.96332 |

JUNKER LANDFILL - HUDSON, WISCONSIN

WW-12 SLUG TEST (DISSIPATION)



⊠ WW-12 DISSIPATION — REGRESSED LINE

Le = 236.88 (in)
r = 1 R = 5 (in)

K(ft/day) = 13.0
LN(Re/rw) = 2.2507

Lw= 236.88 (in)
A= 3.9
B= 0.6
H= 2400 (in)

Regression Output:

Constant -1.0550119
Std Err of Y Est 0.114265328
R Squared 0.620941316
No. of Observations 60
Degrees of Freedom 58

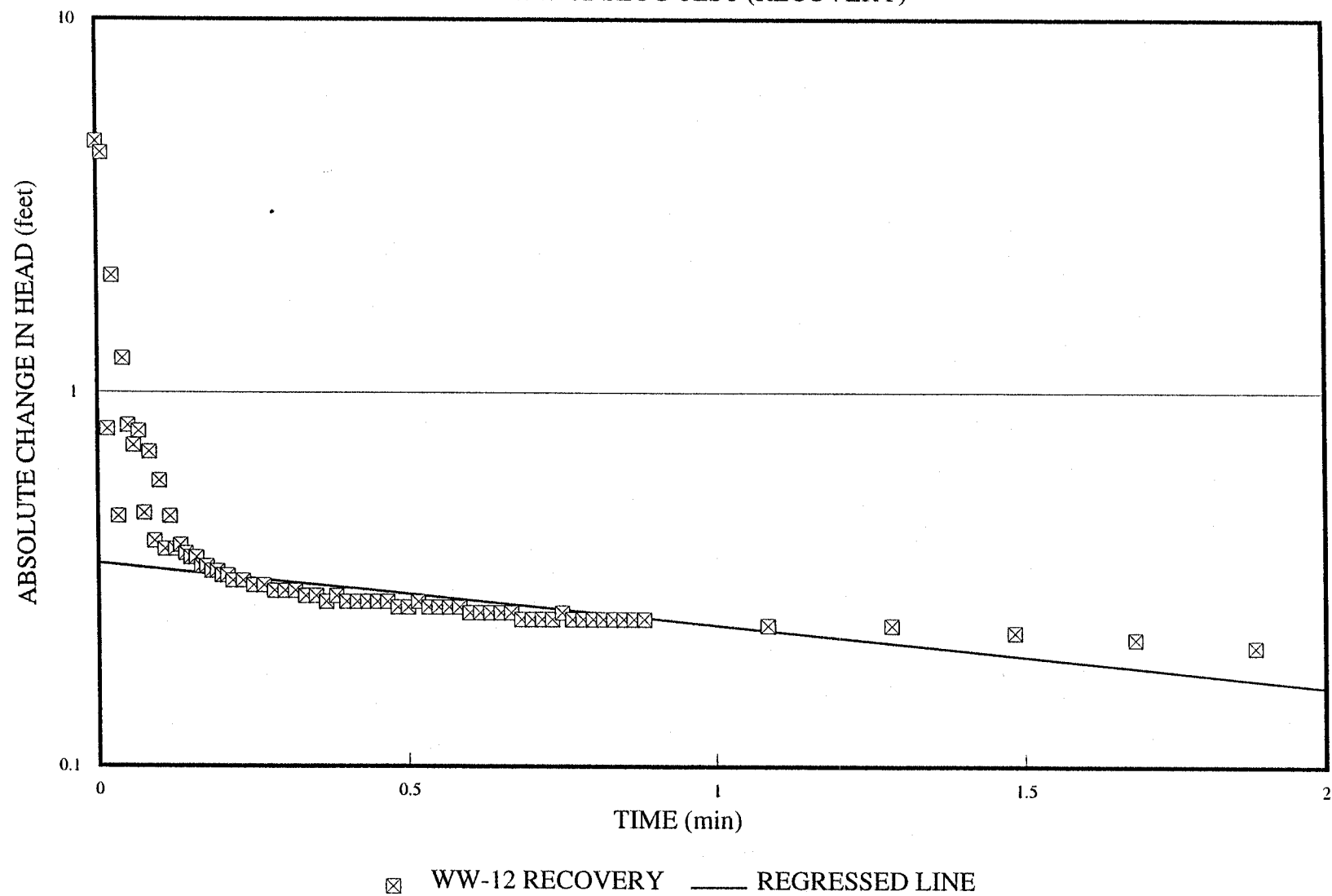
X Coefficient(s) -0.38097
Std Err of Coef. 0.039085

| TIME (min) | HEAD(FT) | Delta Phi | abs(dphi) | REG-LINE | X | ln(dPHI) |
|------------|----------|-----------|-----------|----------|---------|----------|
| 0 | -13.347 | 0.114 | 0.114 | 0.364004 | -0.1166 | -2.17156 |
| 0.0083 | -13.347 | 0.114 | 0.114 | 0.362855 | -0.1083 | -2.17156 |
| 0.0166 | -13.347 | 0.114 | 0.114 | 0.361709 | -0.1 | -2.17156 |
| 0.025 | -13.347 | 0.114 | 0.114 | 0.360554 | -0.0916 | -2.17156 |
| 0.0333 | -13.347 | 0.114 | 0.114 | 0.359415 | -0.0833 | -2.17156 |
| 0.0416 | -13.347 | 0.114 | 0.114 | 0.358281 | -0.075 | -2.17156 |
| 0.05 | -13.347 | 0.114 | 0.114 | 0.357136 | -0.0666 | -2.17156 |
| 0.0583 | -13.347 | 0.114 | 0.114 | 0.356008 | -0.0583 | -2.17156 |
| 0.0666 | -13.347 | 0.114 | 0.114 | 0.354884 | -0.05 | -2.17156 |
| 0.075 | -13.347 | 0.114 | 0.114 | 0.353751 | -0.0416 | -2.17156 |
| 0.0833 | -13.356 | 0.123 | 0.123 | 0.352634 | -0.0333 | -2.09557 |
| 0.0916 | -13.356 | 0.123 | 0.123 | 0.35152 | -0.025 | -2.09557 |
| 0.1 | -13.347 | 0.114 | 0.114 | 0.350397 | -0.0166 | -2.17156 |
| 0.1083 | -12.532 | -0.701 | 0.701 | 0.349291 | -0.0083 | -0.35525 |
| 0.1166 | -8.529 | -4.704 | 4.704 | 0.348188 | 0 | 1.548413 |
| 0.125 | -8.851 | -4.382 | 4.382 | 0.347076 | 0.0084 | 1.477505 |
| 0.1333 | -14.029 | 0.796 | 0.796 | 0.34598 | 0.0167 | -0.22816 |
| 0.1416 | -11.178 | -2.055 | 2.055 | 0.344888 | 0.025 | 0.720276 |
| 0.15 | -12.769 | -0.464 | 0.464 | 0.343786 | 0.0334 | -0.76787 |
| 0.1583 | -12.002 | -1.231 | 1.231 | 0.3427 | 0.0417 | 0.207827 |
| 0.1666 | -12.419 | -0.814 | 0.814 | 0.341619 | 0.05 | -0.20579 |
| 0.175 | -12.513 | -0.72 | 0.72 | 0.340527 | 0.0584 | -0.3285 |
| 0.1833 | -12.447 | -0.786 | 0.786 | 0.339452 | 0.0667 | -0.2408 |
| 0.1916 | -12.76 | -0.473 | 0.473 | 0.33838 | 0.075 | -0.74866 |
| 0.2 | -12.542 | -0.691 | 0.691 | 0.337299 | 0.0834 | -0.36962 |
| 0.2083 | -12.835 | -0.398 | 0.398 | 0.336234 | 0.0917 | -0.9213 |
| 0.2166 | -12.655 | -0.578 | 0.578 | 0.335173 | 0.1 | -0.54818 |
| 0.225 | -12.854 | -0.379 | 0.379 | 0.334102 | 0.1084 | -0.97022 |
| 0.2333 | -12.769 | -0.464 | 0.464 | 0.333047 | 0.1167 | -0.76787 |
| 0.2416 | -12.854 | -0.379 | 0.379 | 0.331996 | 0.125 | -0.97022 |
| 0.25 | -12.845 | -0.388 | 0.388 | 0.330935 | 0.1334 | -0.94675 |
| 0.2583 | -12.864 | -0.369 | 0.369 | 0.32989 | 0.1417 | -0.99696 |
| 0.2666 | -12.873 | -0.36 | 0.36 | 0.328849 | 0.15 | -1.02165 |
| 0.275 | -12.873 | -0.36 | 0.36 | 0.327798 | 0.1584 | -1.02165 |
| 0.2833 | -12.892 | -0.341 | 0.341 | 0.326763 | 0.1667 | -1.07587 |
| 0.2916 | -12.892 | -0.341 | 0.341 | 0.325731 | 0.175 | -1.07587 |
| 0.3 | -12.902 | -0.331 | 0.331 | 0.324691 | 0.1834 | -1.10564 |
| 0.3083 | -12.902 | -0.331 | 0.331 | 0.323666 | 0.1917 | -1.10564 |
| 0.3166 | -12.911 | -0.322 | 0.322 | 0.322644 | 0.2 | -1.1332 |
| 0.325 | -12.911 | -0.322 | 0.322 | 0.321613 | 0.2084 | -1.1332 |
| 0.3333 | -12.921 | -0.312 | 0.312 | 0.320597 | 0.2167 | -1.16475 |
| 0.35 | -12.921 | -0.312 | 0.312 | 0.318564 | 0.2334 | -1.16475 |
| 0.3666 | -12.93 | -0.303 | 0.303 | 0.316556 | 0.25 | -1.19402 |
| 0.3833 | -12.93 | -0.303 | 0.303 | 0.314548 | 0.2667 | -1.19402 |
| 0.4 | -12.94 | -0.293 | 0.293 | 0.312553 | 0.2834 | -1.22758 |
| 0.4166 | -12.94 | -0.293 | 0.293 | 0.310583 | 0.3 | -1.22758 |
| 0.4333 | -12.94 | -0.293 | 0.293 | 0.308613 | 0.3167 | -1.22758 |
| 0.45 | -12.949 | -0.284 | 0.284 | 0.306656 | 0.3334 | -1.25878 |
| 0.4666 | -12.949 | -0.284 | 0.284 | 0.304723 | 0.35 | -1.25878 |
| 0.4833 | -12.959 | -0.274 | 0.274 | 0.30279 | 0.3667 | -1.29463 |
| 0.5 | -12.949 | -0.284 | 0.284 | 0.30087 | 0.3834 | -1.25878 |
| 0.5166 | -12.959 | -0.274 | 0.274 | 0.298973 | 0.4 | -1.29463 |

| | | | | | | |
|--------|---------|--------|-------|----------|--------|----------|
| 0.5333 | -12.959 | -0.274 | 0.274 | 0.297077 | 0.4167 | -1.29463 |
| 0.55 | -12.959 | -0.274 | 0.274 | 0.295193 | 0.4334 | -1.29463 |
| 0.5666 | -12.959 | -0.274 | 0.274 | 0.293332 | 0.45 | -1.29463 |
| 0.5833 | -12.959 | -0.274 | 0.274 | 0.291472 | 0.4667 | -1.29463 |
| 0.6 | -12.968 | -0.265 | 0.265 | 0.289623 | 0.4834 | -1.32803 |
| 0.6166 | -12.968 | -0.265 | 0.265 | 0.287797 | 0.5 | -1.32803 |
| 0.6333 | -12.959 | -0.274 | 0.274 | 0.285972 | 0.5167 | -1.29463 |
| 0.65 | -12.968 | -0.265 | 0.265 | 0.284158 | 0.5334 | -1.32803 |
| 0.6666 | -12.968 | -0.265 | 0.265 | 0.282367 | 0.55 | -1.32803 |
| 0.6833 | -12.968 | -0.265 | 0.265 | 0.280576 | 0.5667 | -1.32803 |
| 0.7 | -12.968 | -0.265 | 0.265 | 0.278797 | 0.5834 | -1.32803 |
| 0.7166 | -12.977 | -0.256 | 0.256 | 0.277039 | 0.6 | -1.36258 |
| 0.7333 | -12.977 | -0.256 | 0.256 | 0.275282 | 0.6167 | -1.36258 |
| 0.75 | -12.977 | -0.256 | 0.256 | 0.273536 | 0.6334 | -1.36258 |
| 0.7666 | -12.977 | -0.256 | 0.256 | 0.271812 | 0.65 | -1.36258 |
| 0.7833 | -12.977 | -0.256 | 0.256 | 0.270088 | 0.6667 | -1.36258 |
| 0.8 | -12.987 | -0.246 | 0.246 | 0.268375 | 0.6834 | -1.40242 |
| 0.8166 | -12.987 | -0.246 | 0.246 | 0.266683 | 0.7 | -1.40242 |
| 0.8333 | -12.987 | -0.246 | 0.246 | 0.264992 | 0.7167 | -1.40242 |
| 0.85 | -12.987 | -0.246 | 0.246 | 0.263311 | 0.7334 | -1.40242 |
| 0.8666 | -12.977 | -0.256 | 0.256 | 0.261651 | 0.75 | -1.36258 |
| 0.8833 | -12.987 | -0.246 | 0.246 | 0.259992 | 0.7667 | -1.40242 |
| 0.9 | -12.987 | -0.246 | 0.246 | 0.258343 | 0.7834 | -1.40242 |
| 0.9166 | -12.987 | -0.246 | 0.246 | 0.256714 | 0.8 | -1.40242 |
| 0.9333 | -12.987 | -0.246 | 0.246 | 0.255086 | 0.8167 | -1.40242 |
| 0.95 | -12.987 | -0.246 | 0.246 | 0.253469 | 0.8334 | -1.40242 |
| 0.9666 | -12.987 | -0.246 | 0.246 | 0.251871 | 0.85 | -1.40242 |
| 0.9833 | -12.987 | -0.246 | 0.246 | 0.250273 | 0.8667 | -1.40242 |
| 1 | -12.987 | -0.246 | 0.246 | 0.248686 | 0.8834 | -1.40242 |
| 1.2 | -12.996 | -0.237 | 0.237 | 0.230441 | 1.0834 | -1.4397 |
| 1.4 | -12.996 | -0.237 | 0.237 | 0.213535 | 1.2834 | -1.4397 |
| 1.6 | -13.006 | -0.227 | 0.227 | 0.197869 | 1.4834 | -1.48281 |
| 1.8 | -13.015 | -0.218 | 0.218 | 0.183353 | 1.6834 | -1.52326 |
| 2 | -13.025 | -0.208 | 0.208 | 0.169901 | 1.8834 | -1.57022 |
| 2.2 | -13.025 | -0.208 | 0.208 | 0.157437 | 2.0834 | -1.57022 |
| 2.4 | -13.034 | -0.199 | 0.199 | 0.145886 | 2.2834 | -1.61445 |
| 2.6 | -13.044 | -0.189 | 0.189 | 0.135183 | 2.4834 | -1.66601 |
| 2.8 | -13.053 | -0.18 | 0.18 | 0.125266 | 2.6834 | -1.7148 |
| 3 | -13.063 | -0.17 | 0.17 | 0.116076 | 2.8834 | -1.77196 |
| 3.2 | -13.072 | -0.161 | 0.161 | 0.10756 | 3.0834 | -1.82635 |
| 3.4 | -13.072 | -0.161 | 0.161 | 0.099669 | 3.2834 | -1.82635 |
| 3.6 | -13.082 | -0.151 | 0.151 | 0.092357 | 3.4834 | -1.89048 |
| 3.8 | -13.091 | -0.142 | 0.142 | 0.085581 | 3.6834 | -1.95193 |
| 4 | -13.101 | -0.132 | 0.132 | 0.079302 | 3.8834 | -2.02495 |
| 4.2 | -13.101 | -0.132 | 0.132 | 0.073485 | 4.0834 | -2.02495 |
| 4.4 | -13.11 | -0.123 | 0.123 | 0.068093 | 4.2834 | -2.09557 |
| 4.6 | -13.12 | -0.113 | 0.113 | 0.063098 | 4.4834 | -2.18037 |
| 4.8 | -13.12 | -0.113 | 0.113 | 0.058469 | 4.6834 | -2.18037 |
| 5 | -13.12 | -0.113 | 0.113 | 0.054179 | 4.8834 | -2.18037 |
| 5.2 | -13.129 | -0.104 | 0.104 | 0.050204 | 5.0834 | -2.26336 |
| 5.4 | -13.139 | -0.094 | 0.094 | 0.046521 | 5.2834 | -2.36446 |
| 5.6 | -13.139 | -0.094 | 0.094 | 0.043108 | 5.4834 | -2.36446 |
| 5.8 | -13.139 | -0.094 | 0.094 | 0.039946 | 5.6834 | -2.36446 |
| 6 | -13.148 | -0.085 | 0.085 | 0.037015 | 5.8834 | -2.4651 |
| 6.2 | -13.148 | -0.085 | 0.085 | 0.034299 | 6.0834 | -2.4651 |
| 6.4 | -13.157 | -0.076 | 0.076 | 0.031783 | 6.2834 | -2.57702 |
| 6.6 | -13.157 | -0.076 | 0.076 | 0.029451 | 6.4834 | -2.57702 |
| 6.8 | -13.167 | -0.066 | 0.066 | 0.027291 | 6.6834 | -2.7181 |
| 7 | -13.167 | -0.066 | 0.066 | 0.025288 | 6.8834 | -2.7181 |
| 7.2 | -13.176 | -0.057 | 0.057 | 0.023433 | 7.0834 | -2.8647 |
| 7.4 | -13.176 | -0.057 | 0.057 | 0.021714 | 7.2834 | -2.8647 |
| 7.6 | -13.176 | -0.057 | 0.057 | 0.020121 | 7.4834 | -2.8647 |
| 7.8 | -13.186 | -0.047 | 0.047 | 0.018645 | 7.6834 | -3.05761 |
| 8 | -13.186 | -0.047 | 0.047 | 0.017277 | 7.8834 | -3.05761 |
| 8.2 | -13.186 | -0.047 | 0.047 | 0.016009 | 8.0834 | -3.05761 |
| 8.4 | -13.195 | -0.038 | 0.038 | 0.014835 | 8.2834 | -3.27017 |
| 8.6 | -13.195 | -0.038 | 0.038 | 0.013747 | 8.4834 | -3.27017 |
| 8.8 | -13.195 | -0.038 | 0.038 | 0.012738 | 8.6834 | -3.27017 |
| 9 | -13.205 | -0.028 | 0.028 | 0.011804 | 8.8834 | -3.57555 |
| 9.2 | -13.205 | -0.028 | 0.028 | 0.010938 | 9.0834 | -3.57555 |
| 9.4 | -13.205 | -0.028 | 0.028 | 0.010135 | 9.2834 | -3.57555 |
| 9.6 | -13.214 | -0.019 | 0.019 | 0.009392 | 9.4834 | -3.96332 |
| 9.8 | -13.214 | -0.019 | 0.019 | 0.008703 | 9.6834 | -3.96332 |
| 10 | -13.205 | -0.028 | 0.028 | 0.008064 | 9.8834 | -3.57555 |

JUNKER LANDFILL - HUDSON, WISCONSIN

WW-12 SLUG TEST (RECOVERY)



**WW-15A DISSIPATION

Bouwer/Rice regress

Le = 93.96 (in)
 r = 1 R = 3 (in)

K(ft/day) = 31.5
 LN(Re/rw) = 2.100518

Lw= 93.96 (in)
 A= 2.25
 B= 0.4
 H= 2400 (in)

Regression Output:

Constant -0.7094296
 Std Err of Y Est 0.006544111
 R Squared 0.943209408
 No. of Observations 16
 Degrees of Freedom 14

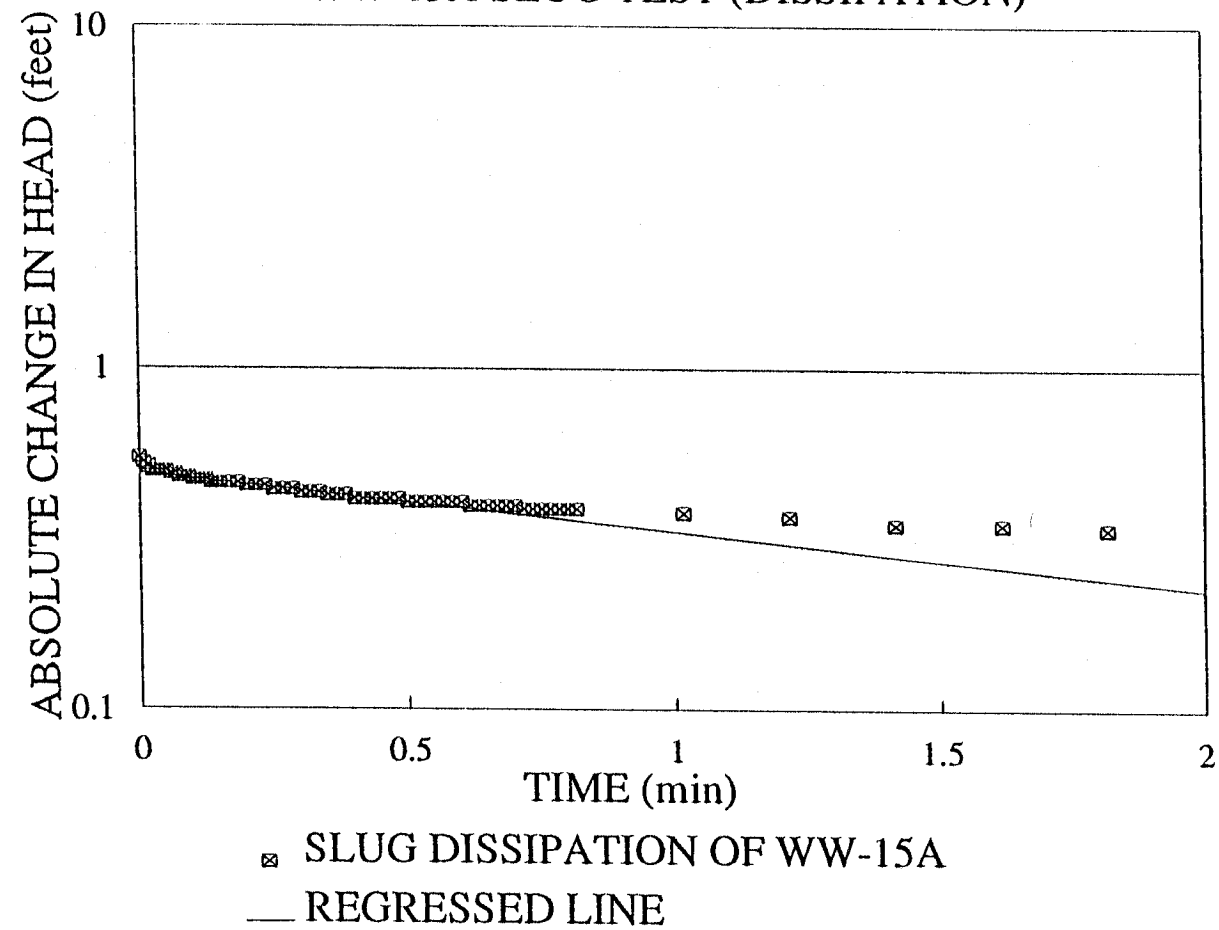
X Coefficient(s) -0.39195
 Std Err of Coef. 0.025704

| TIME (min) | HEAD(FT) | Delta Phi | abs(dphi) | REG-LINE | X | ln(dPHI) |
|------------|----------|-----------|-----------|----------|---------|----------|
| 0 | -0.188 | -0.604 | 0.604 | 0.528567 | -0.1833 | -0.50418 |
| 0.0083 | -0.188 | -0.604 | 0.604 | 0.52685 | -0.175 | -0.50418 |
| 0.0166 | -0.179 | -0.613 | 0.613 | 0.525139 | -0.1667 | -0.48939 |
| 0.025 | -0.188 | -0.604 | 0.604 | 0.523413 | -0.1583 | -0.50418 |
| 0.0333 | -0.188 | -0.604 | 0.604 | 0.521713 | -0.15 | -0.50418 |
| 0.0416 | -0.188 | -0.604 | 0.604 | 0.520019 | -0.1417 | -0.50418 |
| 0.05 | -0.188 | -0.604 | 0.604 | 0.518309 | -0.1333 | -0.50418 |
| 0.0583 | -0.188 | -0.604 | 0.604 | 0.516626 | -0.125 | -0.50418 |
| 0.0666 | -0.188 | -0.604 | 0.604 | 0.514948 | -0.1167 | -0.50418 |
| 0.075 | -0.188 | -0.604 | 0.604 | 0.513255 | -0.1083 | -0.50418 |
| 0.0833 | -0.188 | -0.604 | 0.604 | 0.511588 | -0.1 | -0.50418 |
| 0.0916 | -0.179 | -0.613 | 0.613 | 0.509927 | -0.0917 | -0.48939 |
| 0.1 | -0.198 | -0.594 | 0.594 | 0.508251 | -0.0833 | -0.52088 |
| 0.1083 | -0.273 | -0.519 | 0.519 | 0.5066 | -0.075 | -0.65585 |
| 0.1166 | -1.99 | 1.198 | 1.198 | 0.504955 | -0.0667 | 0.180653 |
| 0.125 | -2.453 | 1.661 | 1.661 | 0.503295 | -0.0583 | 0.50742 |
| 0.1333 | -2.472 | 1.68 | 1.68 | 0.50166 | -0.05 | 0.518794 |
| 0.1416 | -2.368 | 1.576 | 1.576 | 0.500031 | -0.0417 | 0.45489 |
| 0.15 | -1.981 | 1.189 | 1.189 | 0.498387 | -0.0333 | 0.173113 |
| 0.1583 | -0.962 | 0.17 | 0.17 | 0.496769 | -0.025 | -1.77196 |
| 0.1666 | -1.16 | 0.368 | 0.368 | 0.495155 | -0.0167 | -0.99967 |
| 0.175 | -1.32 | 0.528 | 0.528 | 0.493528 | -0.0083 | -0.63866 |
| 0.1833 | -1.339 | 0.547 | 0.547 | 0.491925 | 0 | -0.60331 |
| 0.1916 | -1.32 | 0.528 | 0.528 | 0.490327 | 0.0083 | -0.63866 |
| 0.2 | -1.311 | 0.519 | 0.519 | 0.488715 | 0.0167 | -0.65585 |
| 0.2083 | -1.292 | 0.5 | 0.5 | 0.487128 | 0.025 | -0.69315 |
| 0.2166 | -1.292 | 0.5 | 0.5 | 0.485546 | 0.0333 | -0.69315 |
| 0.225 | -1.292 | 0.5 | 0.5 | 0.48395 | 0.0417 | -0.69315 |
| 0.2333 | -1.292 | 0.5 | 0.5 | 0.482378 | 0.05 | -0.69315 |
| 0.2416 | -1.283 | 0.491 | 0.491 | 0.480811 | 0.0583 | -0.71131 |
| 0.25 | -1.283 | 0.491 | 0.491 | 0.479231 | 0.0667 | -0.71131 |
| 0.2583 | -1.273 | 0.481 | 0.481 | 0.477675 | 0.075 | -0.73189 |
| 0.2666 | -1.273 | 0.481 | 0.481 | 0.476123 | 0.0833 | -0.73189 |
| 0.275 | -1.273 | 0.481 | 0.481 | 0.474558 | 0.0917 | -0.73189 |
| 0.2833 | -1.264 | 0.472 | 0.472 | 0.473017 | 0.1 | -0.75078 |
| 0.2916 | -1.264 | 0.472 | 0.472 | 0.471481 | 0.1083 | -0.75078 |
| 0.3 | -1.264 | 0.472 | 0.472 | 0.469931 | 0.1167 | -0.75078 |
| 0.3083 | -1.264 | 0.472 | 0.472 | 0.468405 | 0.125 | -0.75078 |
| 0.3166 | -1.254 | 0.462 | 0.462 | 0.466883 | 0.1333 | -0.77219 |
| 0.325 | -1.254 | 0.462 | 0.462 | 0.465349 | 0.1417 | -0.77219 |
| 0.3333 | -1.254 | 0.462 | 0.462 | 0.463837 | 0.15 | -0.77219 |

| | | | | | | |
|--------|--------|-------|-------|----------|--------|----------|
| 0.35 | -1.254 | 0.462 | 0.462 | 0.460811 | 0.1667 | -0.77219 |
| 0.3666 | -1.254 | 0.462 | 0.462 | 0.457823 | 0.1833 | -0.77219 |
| 0.3833 | -1.245 | 0.453 | 0.453 | 0.454836 | 0.2 | -0.79186 |
| 0.4 | -1.245 | 0.453 | 0.453 | 0.451868 | 0.2167 | -0.79186 |
| 0.4166 | -1.245 | 0.453 | 0.453 | 0.448938 | 0.2333 | -0.79186 |
| 0.4333 | -1.235 | 0.443 | 0.443 | 0.446009 | 0.25 | -0.81419 |
| 0.45 | -1.235 | 0.443 | 0.443 | 0.443099 | 0.2667 | -0.81419 |
| 0.4666 | -1.235 | 0.443 | 0.443 | 0.440226 | 0.2833 | -0.81419 |
| 0.4833 | -1.226 | 0.434 | 0.434 | 0.437353 | 0.3 | -0.83471 |
| 0.5 | -1.226 | 0.434 | 0.434 | 0.4345 | 0.3167 | -0.83471 |
| 0.5166 | -1.226 | 0.434 | 0.434 | 0.431682 | 0.3333 | -0.83471 |
| 0.5333 | -1.217 | 0.425 | 0.425 | 0.428866 | 0.35 | -0.85567 |
| 0.55 | -1.217 | 0.425 | 0.425 | 0.426068 | 0.3667 | -0.85567 |
| 0.5666 | -1.217 | 0.425 | 0.425 | 0.423305 | 0.3833 | -0.85567 |
| 0.5833 | -1.207 | 0.415 | 0.415 | 0.420543 | 0.4 | -0.87948 |
| 0.6 | -1.207 | 0.415 | 0.415 | 0.4178 | 0.4167 | -0.87948 |
| 0.6166 | -1.207 | 0.415 | 0.415 | 0.41509 | 0.4333 | -0.87948 |
| 0.6333 | -1.207 | 0.415 | 0.415 | 0.412382 | 0.45 | -0.87948 |
| 0.65 | -1.207 | 0.415 | 0.415 | 0.409691 | 0.4667 | -0.87948 |
| 0.6666 | -1.207 | 0.415 | 0.415 | 0.407035 | 0.4833 | -0.87948 |
| 0.6833 | -1.198 | 0.406 | 0.406 | 0.404379 | 0.5 | -0.9014 |
| 0.7 | -1.198 | 0.406 | 0.406 | 0.401741 | 0.5167 | -0.9014 |
| 0.7166 | -1.198 | 0.406 | 0.406 | 0.399135 | 0.5333 | -0.9014 |
| 0.7333 | -1.198 | 0.406 | 0.406 | 0.396531 | 0.55 | -0.9014 |
| 0.75 | -1.198 | 0.406 | 0.406 | 0.393944 | 0.5667 | -0.9014 |
| 0.7666 | -1.198 | 0.406 | 0.406 | 0.39139 | 0.5833 | -0.9014 |
| 0.7833 | -1.198 | 0.406 | 0.406 | 0.388836 | 0.6 | -0.9014 |
| 0.8 | -1.188 | 0.396 | 0.396 | 0.386299 | 0.6167 | -0.92634 |
| 0.8166 | -1.188 | 0.396 | 0.396 | 0.383794 | 0.6333 | -0.92634 |
| 0.8333 | -1.188 | 0.396 | 0.396 | 0.38129 | 0.65 | -0.92634 |
| 0.85 | -1.188 | 0.396 | 0.396 | 0.378803 | 0.6667 | -0.92634 |
| 0.8666 | -1.188 | 0.396 | 0.396 | 0.376346 | 0.6833 | -0.92634 |
| 0.8833 | -1.188 | 0.396 | 0.396 | 0.373891 | 0.7 | -0.92634 |
| 0.9 | -1.179 | 0.387 | 0.387 | 0.371451 | 0.7167 | -0.94933 |
| 0.9166 | -1.179 | 0.387 | 0.387 | 0.369042 | 0.7333 | -0.94933 |
| 0.9333 | -1.179 | 0.387 | 0.387 | 0.366635 | 0.75 | -0.94933 |
| 0.95 | -1.179 | 0.387 | 0.387 | 0.364243 | 0.7667 | -0.94933 |
| 0.9666 | -1.179 | 0.387 | 0.387 | 0.361881 | 0.7833 | -0.94933 |
| 0.9833 | -1.179 | 0.387 | 0.387 | 0.35952 | 0.8 | -0.94933 |
| 1 | -1.179 | 0.387 | 0.387 | 0.357174 | 0.8167 | -0.94933 |
| 1.2 | -1.169 | 0.377 | 0.377 | 0.330245 | 1.0167 | -0.97551 |
| 1.4 | -1.16 | 0.368 | 0.368 | 0.305346 | 1.2167 | -0.99967 |
| 1.6 | -1.141 | 0.349 | 0.349 | 0.282324 | 1.4167 | -1.05268 |
| 1.8 | -1.141 | 0.349 | 0.349 | 0.261038 | 1.6167 | -1.05268 |
| 2 | -1.132 | 0.34 | 0.34 | 0.241357 | 1.8167 | -1.07881 |
| 2.2 | -1.122 | 0.33 | 0.33 | 0.22316 | 2.0167 | -1.10866 |
| 2.4 | -1.122 | 0.33 | 0.33 | 0.206334 | 2.2167 | -1.10866 |
| 2.6 | -1.113 | 0.321 | 0.321 | 0.190778 | 2.4167 | -1.13631 |
| 2.8 | -1.103 | 0.311 | 0.311 | 0.176394 | 2.6167 | -1.16796 |
| 3 | -1.103 | 0.311 | 0.311 | 0.163095 | 2.8167 | -1.16796 |
| 3.2 | -1.094 | 0.302 | 0.302 | 0.150798 | 3.0167 | -1.19733 |
| 3.4 | -1.084 | 0.292 | 0.292 | 0.139429 | 3.2167 | -1.231 |
| 3.6 | -1.084 | 0.292 | 0.292 | 0.128916 | 3.4167 | -1.231 |
| 3.8 | -1.075 | 0.283 | 0.283 | 0.119197 | 3.6167 | -1.26231 |
| 4 | -1.075 | 0.283 | 0.283 | 0.11021 | 3.8167 | -1.26231 |
| 4.2 | -1.066 | 0.274 | 0.274 | 0.1019 | 4.0167 | -1.29463 |
| 4.4 | -1.066 | 0.274 | 0.274 | 0.094217 | 4.2167 | -1.29463 |
| 4.6 | -1.056 | 0.264 | 0.264 | 0.087114 | 4.4167 | -1.33181 |
| 4.8 | -1.056 | 0.264 | 0.264 | 0.080546 | 4.6167 | -1.33181 |
| 5 | -1.056 | 0.264 | 0.264 | 0.074473 | 4.8167 | -1.33181 |
| 5.2 | -1.047 | 0.255 | 0.255 | 0.068858 | 5.0167 | -1.36649 |
| 5.4 | -1.047 | 0.255 | 0.255 | 0.063667 | 5.2167 | -1.36649 |
| 5.6 | -1.037 | 0.245 | 0.245 | 0.058866 | 5.4167 | -1.4065 |
| 5.8 | -1.037 | 0.245 | 0.245 | 0.054428 | 5.6167 | -1.4065 |
| 6 | -1.028 | 0.236 | 0.236 | 0.050324 | 5.8167 | -1.44392 |
| 6.2 | -1.028 | 0.236 | 0.236 | 0.04653 | 6.0167 | -1.44392 |
| 6.4 | -1.028 | 0.236 | 0.236 | 0.043022 | 6.2167 | -1.44392 |
| 6.6 | -1.018 | 0.226 | 0.226 | 0.039778 | 6.4167 | -1.48722 |
| 6.8 | -1.018 | 0.226 | 0.226 | 0.036779 | 6.6167 | -1.48722 |
| 7 | -1.018 | 0.226 | 0.226 | 0.034006 | 6.8167 | -1.48722 |
| 7.2 | -1.009 | 0.217 | 0.217 | 0.031442 | 7.0167 | -1.52786 |
| 7.4 | -1.009 | 0.217 | 0.217 | 0.029072 | 7.2167 | -1.52786 |
| 7.6 | -1.009 | 0.217 | 0.217 | 0.02688 | 7.4167 | -1.52786 |
| 7.8 | -1 | 0.208 | 0.208 | 0.024853 | 7.6167 | -1.57022 |

| | | | | | | |
|-----|--------|-------|-------|----------|---------|----------|
| 8 | -1 | 0.208 | 0.208 | 0.022979 | 7.8167 | -1.57022 |
| 8.2 | -1 | 0.208 | 0.208 | 0.021247 | 8.0167 | -1.57022 |
| 8.4 | -0.99 | 0.198 | 0.198 | 0.019645 | 8.2167 | -1.61949 |
| 8.6 | -0.99 | 0.198 | 0.198 | 0.018164 | 8.4167 | -1.61949 |
| 8.8 | -0.981 | 0.189 | 0.189 | 0.016794 | 8.6167 | -1.66601 |
| 9 | -0.981 | 0.189 | 0.189 | 0.015528 | 8.8167 | -1.66601 |
| 9.2 | -0.981 | 0.189 | 0.189 | 0.014357 | 9.0167 | -1.66601 |
| 9.4 | -0.981 | 0.189 | 0.189 | 0.013275 | 9.2167 | -1.66601 |
| 9.6 | -0.981 | 0.189 | 0.189 | 0.012274 | 9.4167 | -1.66601 |
| 9.8 | -0.971 | 0.179 | 0.179 | 0.011349 | 9.6167 | -1.72037 |
| 10 | -0.971 | 0.179 | 0.179 | 0.010493 | 9.8167 | -1.72037 |
| 12 | -0.943 | 0.151 | 0.151 | 0.004791 | 11.8167 | -1.89048 |
| 14 | -0.915 | 0.123 | 0.123 | 0.002188 | 13.8167 | -2.09557 |
| 16 | -0.886 | 0.094 | 0.094 | 0.000999 | 15.8167 | -2.36446 |
| 18 | -0.867 | 0.075 | 0.075 | 0.000456 | 17.8167 | -2.59027 |
| 20 | -0.849 | 0.057 | 0.057 | 0.000208 | 19.8167 | -2.8647 |
| 22 | -0.83 | 0.038 | 0.038 | 0.000095 | 21.8167 | -3.27017 |
| 24 | -0.82 | 0.028 | 0.028 | 0.000043 | 23.8167 | -3.57555 |
| 26 | -0.801 | 0.009 | 0.009 | 0.00002 | 25.8167 | -4.71053 |
| 28 | -0.792 | 0 | 0 | 9.1E-06 | 27.8167 | ERR |

JUNKER LANDFILL - HUDSON, WISCONSIN
WW-15A SLUG TEST (DISSIPATION)



Le = 96.72 (in)
r = 1 R = 3 (in)

K(ft/day) = 47.2
LN(Re/rw) = 2.13254

Lw = 96.72 (in)
A = 2.25
B = 0.4
H = 2400 (in)

Regression Output:

Constant -0.06448563
Std Err of Y Est 0.013384372
R Squared 0.883979634
No. of Observations 19
Degrees of Freedom 17

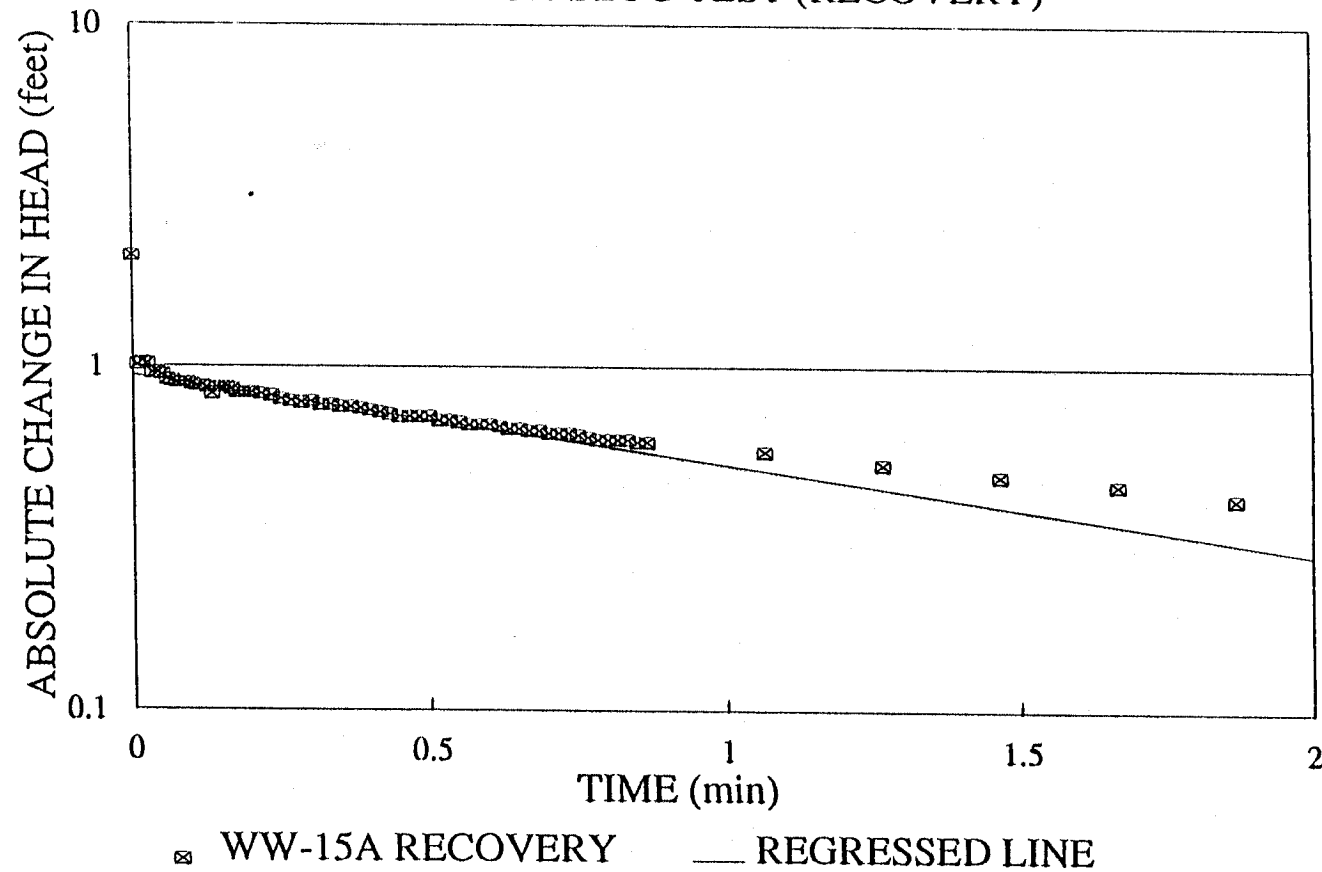
X Coefficient(s) -0.59437
Std Err of Coef. 0.052225

| TIME (min) | HEAD(FT) | Delta Phi | abs(dphi) | REG-LINE | X | ln(dPHI) |
|------------|----------|-----------|-----------|----------|---------|----------|
| 0 | 0.009 | -0.566 | 0.566 | 1.014854 | -0.1333 | -0.56916 |
| 0.0083 | 0.009 | -0.566 | 0.566 | 1.00986 | -0.125 | -0.56916 |
| 0.0166 | 0.009 | -0.566 | 0.566 | 1.00489 | -0.1167 | -0.56916 |
| 0.025 | 0.009 | -0.566 | 0.566 | 0.999885 | -0.1083 | -0.56916 |
| 0.0333 | 0.009 | -0.566 | 0.566 | 0.994965 | -0.1 | -0.56916 |
| 0.0416 | 0.009 | -0.566 | 0.566 | 0.990068 | -0.0917 | -0.56916 |
| 0.05 | 0.009 | -0.566 | 0.566 | 0.985137 | -0.0833 | -0.56916 |
| 0.0583 | 0.009 | -0.566 | 0.566 | 0.980289 | -0.075 | -0.56916 |
| 0.0666 | 0.009 | -0.566 | 0.566 | 0.975465 | -0.0667 | -0.56916 |
| 0.075 | 0.009 | -0.566 | 0.566 | 0.970607 | -0.0583 | -0.56916 |
| 0.0833 | 0.009 | -0.566 | 0.566 | 0.965831 | -0.05 | -0.56916 |
| 0.0916 | 0.009 | -0.566 | 0.566 | 0.961078 | -0.0417 | -0.56916 |
| 0.1 | 0.009 | -0.566 | 0.566 | 0.956291 | -0.0333 | -0.56916 |
| 0.1083 | 0.009 | -0.566 | 0.566 | 0.951585 | -0.025 | -0.56916 |
| 0.1166 | 1.396 | 0.821 | 0.821 | 0.946902 | -0.0167 | -0.19723 |
| 0.125 | 7.567 | 6.992 | 6.992 | 0.942186 | -0.0083 | 1.944767 |
| 0.1333 | 2.687 | 2.112 | 2.112 | 0.93755 | 0 | 0.747635 |
| 0.1416 | 1.584 | 1.009 | 1.009 | 0.932936 | 0.0083 | 0.00896 |
| 0.15 | 1.603 | 1.028 | 1.028 | 0.928289 | 0.0167 | 0.027615 |
| 0.1583 | 1.594 | 1.019 | 1.019 | 0.923721 | 0.025 | 0.018822 |
| 0.1666 | 1.528 | 0.953 | 0.953 | 0.919175 | 0.0333 | -0.04814 |
| 0.175 | 1.528 | 0.953 | 0.953 | 0.914598 | 0.0417 | -0.04814 |
| 0.1833 | 1.518 | 0.943 | 0.943 | 0.910097 | 0.05 | -0.05869 |
| 0.1916 | 1.49 | 0.915 | 0.915 | 0.905618 | 0.0583 | -0.08883 |
| 0.2 | 1.48 | 0.905 | 0.905 | 0.901108 | 0.0667 | -0.09982 |
| 0.2083 | 1.471 | 0.896 | 0.896 | 0.896673 | 0.075 | -0.10981 |
| 0.2166 | 1.471 | 0.896 | 0.896 | 0.892261 | 0.0833 | -0.10981 |
| 0.225 | 1.471 | 0.896 | 0.896 | 0.887817 | 0.0917 | -0.10981 |
| 0.2333 | 1.462 | 0.887 | 0.887 | 0.883448 | 0.1 | -0.11991 |
| 0.2416 | 1.452 | 0.877 | 0.877 | 0.8791 | 0.1083 | -0.13125 |
| 0.25 | 1.452 | 0.877 | 0.877 | 0.874722 | 0.1167 | -0.13125 |
| 0.2583 | 1.443 | 0.868 | 0.868 | 0.870417 | 0.125 | -0.14156 |
| 0.2666 | 1.405 | 0.83 | 0.83 | 0.866134 | 0.1333 | -0.18633 |
| 0.275 | 1.443 | 0.868 | 0.868 | 0.86182 | 0.1417 | -0.14156 |
| 0.2833 | 1.443 | 0.868 | 0.868 | 0.857579 | 0.15 | -0.14156 |
| 0.2916 | 1.443 | 0.868 | 0.868 | 0.853359 | 0.1583 | -0.14156 |
| 0.3 | 1.433 | 0.858 | 0.858 | 0.849109 | 0.1667 | -0.15315 |
| 0.3083 | 1.414 | 0.839 | 0.839 | 0.84493 | 0.175 | -0.17554 |
| 0.3166 | 1.414 | 0.839 | 0.839 | 0.840772 | 0.1833 | -0.17554 |
| 0.325 | 1.414 | 0.839 | 0.839 | 0.836585 | 0.1917 | -0.17554 |
| 0.3333 | 1.414 | 0.839 | 0.839 | 0.832468 | 0.2 | -0.17554 |
| 0.35 | 1.405 | 0.83 | 0.83 | 0.824246 | 0.2167 | -0.18633 |
| 0.3666 | 1.396 | 0.821 | 0.821 | 0.816153 | 0.2333 | -0.19723 |
| 0.3833 | 1.377 | 0.802 | 0.802 | 0.808092 | 0.25 | -0.22065 |
| 0.4 | 1.367 | 0.792 | 0.792 | 0.800111 | 0.2667 | -0.23319 |
| 0.4166 | 1.358 | 0.783 | 0.783 | 0.792255 | 0.2833 | -0.24462 |
| 0.4333 | 1.367 | 0.792 | 0.792 | 0.78443 | 0.3 | -0.23319 |
| 0.45 | 1.348 | 0.773 | 0.773 | 0.776682 | 0.3167 | -0.25748 |
| 0.4666 | 1.348 | 0.773 | 0.773 | 0.769057 | 0.3333 | -0.25748 |
| 0.4833 | 1.339 | 0.764 | 0.764 | 0.761461 | 0.35 | -0.26919 |
| 0.5 | 1.339 | 0.764 | 0.764 | 0.75394 | 0.3667 | -0.26919 |
| 0.5166 | 1.33 | 0.755 | 0.755 | 0.746537 | 0.3833 | -0.28104 |

| | | | | | | |
|--------|-------|-------|-------|----------|---------|----------|
| 0.5333 | 1.32 | 0.745 | 0.745 | 0.739164 | 0.4 | -0.29437 |
| 0.55 | 1.311 | 0.736 | 0.736 | 0.731863 | 0.4167 | -0.30653 |
| 0.5666 | 1.301 | 0.726 | 0.726 | 0.724678 | 0.4333 | -0.32021 |
| 0.5833 | 1.292 | 0.717 | 0.717 | 0.71752 | 0.45 | -0.33268 |
| 0.6 | 1.292 | 0.717 | 0.717 | 0.710433 | 0.4667 | -0.33268 |
| 0.6166 | 1.292 | 0.717 | 0.717 | 0.703458 | 0.4833 | -0.33268 |
| 0.6333 | 1.292 | 0.717 | 0.717 | 0.69651 | 0.5 | -0.33268 |
| 0.65 | 1.273 | 0.698 | 0.698 | 0.689631 | 0.5167 | -0.35954 |
| 0.6666 | 1.273 | 0.698 | 0.698 | 0.68286 | 0.5333 | -0.35954 |
| 0.6833 | 1.264 | 0.689 | 0.689 | 0.676115 | 0.55 | -0.37251 |
| 0.7 | 1.254 | 0.679 | 0.679 | 0.669437 | 0.5667 | -0.38713 |
| 0.7166 | 1.254 | 0.679 | 0.679 | 0.662865 | 0.5833 | -0.38713 |
| 0.7333 | 1.254 | 0.679 | 0.679 | 0.656318 | 0.6 | -0.38713 |
| 0.75 | 1.245 | 0.67 | 0.67 | 0.649835 | 0.6167 | -0.40048 |
| 0.7666 | 1.235 | 0.66 | 0.66 | 0.643455 | 0.6333 | -0.41552 |
| 0.7833 | 1.235 | 0.66 | 0.66 | 0.6371 | 0.65 | -0.41552 |
| 0.8 | 1.226 | 0.651 | 0.651 | 0.630807 | 0.6667 | -0.42925 |
| 0.8166 | 1.226 | 0.651 | 0.651 | 0.624614 | 0.6833 | -0.42925 |
| 0.8333 | 1.216 | 0.641 | 0.641 | 0.618444 | 0.7 | -0.44473 |
| 0.85 | 1.216 | 0.641 | 0.641 | 0.612336 | 0.7167 | -0.44473 |
| 0.8666 | 1.216 | 0.641 | 0.641 | 0.606324 | 0.7333 | -0.44473 |
| 0.8833 | 1.207 | 0.632 | 0.632 | 0.600335 | 0.75 | -0.45887 |
| 0.9 | 1.198 | 0.623 | 0.623 | 0.594406 | 0.7667 | -0.47321 |
| 0.9166 | 1.188 | 0.613 | 0.613 | 0.58857 | 0.7833 | -0.48939 |
| 0.9333 | 1.188 | 0.613 | 0.613 | 0.582757 | 0.8 | -0.48939 |
| 0.95 | 1.188 | 0.613 | 0.613 | 0.577001 | 0.8167 | -0.48939 |
| 0.9666 | 1.188 | 0.613 | 0.613 | 0.571336 | 0.8333 | -0.48939 |
| 0.9833 | 1.179 | 0.604 | 0.604 | 0.565693 | 0.85 | -0.50418 |
| 1 | 1.179 | 0.604 | 0.604 | 0.560105 | 0.8667 | -0.50418 |
| 1.2 | 1.141 | 0.566 | 0.566 | 0.497328 | 1.0667 | -0.56916 |
| 1.4 | 1.094 | 0.519 | 0.519 | 0.441587 | 1.2667 | -0.65585 |
| 1.6 | 1.056 | 0.481 | 0.481 | 0.392093 | 1.4667 | -0.73189 |
| 1.8 | 1.028 | 0.453 | 0.453 | 0.348147 | 1.6667 | -0.79186 |
| 2 | 0.99 | 0.415 | 0.415 | 0.309126 | 1.8667 | -0.87948 |
| 2.2 | 0.952 | 0.377 | 0.377 | 0.274479 | 2.0667 | -0.97551 |
| 2.4 | 0.933 | 0.358 | 0.358 | 0.243715 | 2.2667 | -1.02722 |
| 2.6 | 0.905 | 0.33 | 0.33 | 0.216399 | 2.4667 | -1.10866 |
| 2.8 | 0.877 | 0.302 | 0.302 | 0.192145 | 2.6667 | -1.19733 |
| 3 | 0.858 | 0.283 | 0.283 | 0.170609 | 2.8667 | -1.26231 |
| 3.2 | 0.839 | 0.264 | 0.264 | 0.151487 | 3.0667 | -1.33181 |
| 3.4 | 0.82 | 0.245 | 0.245 | 0.134508 | 3.2667 | -1.4065 |
| 3.6 | 0.811 | 0.236 | 0.236 | 0.119432 | 3.4667 | -1.44392 |
| 3.8 | 0.792 | 0.217 | 0.217 | 0.106046 | 3.6667 | -1.52786 |
| 4 | 0.783 | 0.208 | 0.208 | 0.09416 | 3.8667 | -1.57022 |
| 4.2 | 0.773 | 0.198 | 0.198 | 0.083607 | 4.0667 | -1.61949 |
| 4.4 | 0.764 | 0.189 | 0.189 | 0.074236 | 4.2667 | -1.66601 |
| 4.6 | 0.745 | 0.17 | 0.17 | 0.065916 | 4.4667 | -1.77196 |
| 4.8 | 0.735 | 0.16 | 0.16 | 0.058528 | 4.6667 | -1.83258 |
| 5 | 0.726 | 0.151 | 0.151 | 0.051968 | 4.8667 | -1.89048 |
| 5.2 | 0.726 | 0.151 | 0.151 | 0.046143 | 5.0667 | -1.89048 |
| 5.4 | 0.716 | 0.141 | 0.141 | 0.040971 | 5.2667 | -1.959 |
| 5.6 | 0.707 | 0.132 | 0.132 | 0.036379 | 5.4667 | -2.02495 |
| 5.8 | 0.698 | 0.123 | 0.123 | 0.032302 | 5.6667 | -2.09557 |
| 6 | 0.698 | 0.123 | 0.123 | 0.028681 | 5.8667 | -2.09557 |
| 6.2 | 0.688 | 0.113 | 0.113 | 0.025467 | 6.0667 | -2.18037 |
| 6.4 | 0.679 | 0.104 | 0.104 | 0.022612 | 6.2667 | -2.26336 |
| 6.6 | 0.679 | 0.104 | 0.104 | 0.020078 | 6.4667 | -2.26336 |
| 6.8 | 0.669 | 0.094 | 0.094 | 0.017828 | 6.6667 | -2.36446 |
| 7 | 0.669 | 0.094 | 0.094 | 0.01583 | 6.8667 | -2.36446 |
| 7.2 | 0.66 | 0.085 | 0.085 | 0.014055 | 7.0667 | -2.4651 |
| 7.4 | 0.66 | 0.085 | 0.085 | 0.01248 | 7.2667 | -2.4651 |
| 7.6 | 0.65 | 0.075 | 0.075 | 0.011081 | 7.4667 | -2.59027 |
| 7.8 | 0.65 | 0.075 | 0.075 | 0.009839 | 7.6667 | -2.59027 |
| 8 | 0.641 | 0.066 | 0.066 | 0.008736 | 7.8667 | -2.7181 |
| 8.2 | 0.641 | 0.066 | 0.066 | 0.007757 | 8.0667 | -2.7181 |
| 8.4 | 0.641 | 0.066 | 0.066 | 0.006888 | 8.2667 | -2.7181 |
| 8.6 | 0.632 | 0.057 | 0.057 | 0.006116 | 8.4667 | -2.8647 |
| 8.8 | 0.632 | 0.057 | 0.057 | 0.00543 | 8.6667 | -2.8647 |
| 9 | 0.622 | 0.047 | 0.047 | 0.004822 | 8.8667 | -3.05761 |
| 9.2 | 0.622 | 0.047 | 0.047 | 0.004281 | 9.0667 | -3.05761 |
| 9.4 | 0.622 | 0.047 | 0.047 | 0.003801 | 9.2667 | -3.05761 |
| 9.6 | 0.622 | 0.047 | 0.047 | 0.003375 | 9.4667 | -3.05761 |
| 9.8 | 0.613 | 0.038 | 0.038 | 0.002997 | 9.6667 | -3.27017 |
| 10 | 0.613 | 0.038 | 0.038 | 0.002661 | 9.8667 | -3.27017 |
| 12 | 0.594 | 0.019 | 0.019 | 0.000811 | 11.8667 | -3.96332 |
| 14 | 0.575 | 0 | 0 | 0.000247 | 13.8667 | ERR |

JUNKER LANDFILL - HUDSON, WISCONSIN

WW-15A SLUG TEST (RECOVERY)



Appendix K

WDNR Forms

| | | |
|--|---|--|
| Facility/Project Name JUNKER LANDFILL | Local Grid Location of Well ft. <input type="checkbox"/> N. <input type="checkbox"/> E. <input type="checkbox"/> S. <input type="checkbox"/> W. | Well Name WW-11 |
| Utility License, Permit or Monitoring Number | Grid Origin Location Lat. _____ Long. _____ or _____ | Wis. Unique Well Number GT 505 DNR Well Number |
| Type of Well Water Table Observation Well <input checked="" type="checkbox"/> 11 Piezometer <input type="checkbox"/> 12 | St. Plane 433042.7 ft. N. 1323035.3 ft. E. | Date Well Installed 02/08/95 m m d d y y |
| Distance Well Is From Waste/Source Boundary ft. | Section Location of Waste/Source NW 1/4 of NW 1/4 of Sec. 19 T. 29 N. R. 18 E. W. | Well Installed By: (Person's Name and Firm) VICTOR PRAUGHT |
| Is Well A Point of Enforcement Std. Application? <input type="checkbox"/> Yes <input type="checkbox"/> No | Location of Well Relative to Waste/Source u <input checked="" type="checkbox"/> Upgradient s <input type="checkbox"/> Sidegradient d <input type="checkbox"/> Downgradient n <input type="checkbox"/> Not Known | E.H. RENNER & SONS, INC. |

| | |
|---|--|
| A. Protective pipe, top elevation _____ ft. MSL | 1. Cap and lock? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| B. Well casing, top elevation 1034.16 ft. MSL | 2. Protective cover pipe: a. Inside diameter: 6 in. b. Length: 134 ft. c. Material: Steel <input checked="" type="checkbox"/> 04 Other <input type="checkbox"/> |
| C. Land surface elevation 1032.2 ft. MSL | d. Additional protection? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe: _____ |
| D. Surface seal, bottom _____ ft. MSL or _____ ft. | 3. Surface seal: Bentonite <input type="checkbox"/> 30 Concrete <input type="checkbox"/> 01 Other <input checked="" type="checkbox"/> |
| 12. USCS classification of soil near screen: GP <input type="checkbox"/> GM <input type="checkbox"/> GC <input type="checkbox"/> GW <input type="checkbox"/> SW <input type="checkbox"/> SP <input type="checkbox"/> SM <input type="checkbox"/> SC <input type="checkbox"/> ML <input type="checkbox"/> MH <input type="checkbox"/> CL <input type="checkbox"/> CH <input type="checkbox"/> Bedrock <input checked="" type="checkbox"/> | 4. Material between well casing and protective pipe: Bentonite <input checked="" type="checkbox"/> 30 Annular space seal <input type="checkbox"/> Other <input type="checkbox"/> |
| 13. Sieve analysis attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 5. Annular space seal: a. Granular Bentonite <input type="checkbox"/> 33 b. 10 Lbs/gal mud weight ... Bentonite-sand slurry <input checked="" type="checkbox"/> 35 c. 2 Lbs/gal mud weight ... Bentonite slurry <input type="checkbox"/> 31 d. _____ % Bentonite ... Bentonite-cement grout <input type="checkbox"/> 50 e. _____ Ft ³ volume added for any of the above f. How installed: Tremie <input type="checkbox"/> 01 Tremie pumped <input checked="" type="checkbox"/> 02 Gravity <input type="checkbox"/> 08 |
| 14. Drilling method used: Rotary <input checked="" type="checkbox"/> 50 Hollow Stem Auger <input type="checkbox"/> 41 Other <input type="checkbox"/> | 6. Bentonite seal: a. Bentonite granules <input type="checkbox"/> 33 b. <input checked="" type="checkbox"/> 1/4 in. <input type="checkbox"/> 3/8 in. <input type="checkbox"/> 1/2 in. Bentonite pellets <input type="checkbox"/> 32 c. _____ Other <input type="checkbox"/> |
| 15. Drilling fluid used: Water <input type="checkbox"/> 02 Air <input type="checkbox"/> 01 Drilling Mud <input checked="" type="checkbox"/> 03 None <input type="checkbox"/> 99 | 7. Fine sand material: Manufacturer, product name & mesh size a. UNIMIN 4030/2.4/.25 b. Volume added 1 ft ³ |
| Drilling additives used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 8. Filter pack material: Manufacturer, product name and mesh size a. RED FLINT NO. 30 b. Volume added 7 ft ³ |
| Describe _____ | 9. Well casing: Flush threaded PVC schedule 40 <input type="checkbox"/> 23 Flush threaded PVC schedule 80 <input checked="" type="checkbox"/> 24 Other <input type="checkbox"/> |
| 17. Source of water (attach analysis): CITY OF HUDSON PUBLIC WORKS | 10. Screen material: PVC SCH 80 a. Screen type: Factory cut <input checked="" type="checkbox"/> 11 Continuous slot <input type="checkbox"/> 01 Other <input type="checkbox"/> |
| E. Bentonite seal, top _____ ft. MSL or 123.0 ft. | b. Manufacturer TIMCO c. Slot size: _____ in. d. Slotted length: _____ ft. |
| F. Fine sand, top _____ ft. MSL or 128.0 ft. | 11. Backfill material (below filter pack): None <input checked="" type="checkbox"/> 14 Other <input type="checkbox"/> |
| G. Filter pack, top _____ ft. MSL or 133.0 ft. | |
| H. Screen joint, top _____ ft. MSL or 135.0 ft. | |
| I. Well bottom _____ ft. MSL or 155.0 ft. | |
| J. Filter pack, bottom _____ ft. MSL or 155.0 ft. | |
| K. Borehole, bottom _____ ft. MSL or 155.0 ft. | |
| L. Borehole, diameter 6.0 in. | |
| M. O.D. well casing 2.5 in. | |
| N. I.D. well casing 2.0 in. | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.
Signature *E.H. Renner* Firm **E.H. RENNER & sons, inc.**

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis. Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than \$5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐

| | | |
|--|---------------------------------|---|
| Facility/Project Name <u>Junker Landfill</u> | County Name <u>St. Croix</u> | Well Name <u>WW-11</u> |
| Facility License, Permit or Monitoring Number _____ | County Code <u>56</u> | Wis. Unique Well Number <u>GT505</u> |
| | | DNR Well Number _____ |

1. Can this well be purged dry? ☐ Yes ☒ No
2. Well development method
- | | |
|--------------------------------------|--|
| surged with bailer and bailed | <input type="checkbox"/> 41 |
| surged with bailer and pumped | <input type="checkbox"/> 61 |
| surged with block and bailed | <input type="checkbox"/> 42 |
| surged with block and pumped | <input type="checkbox"/> 62 |
| surged with block, bailed and pumped | <input type="checkbox"/> 70 |
| compressed air | <input checked="" type="checkbox"/> 20 |
| bailed only | <input type="checkbox"/> 10 |
| pumped only | <input checked="" type="checkbox"/> 51 |
| pumped slowly | <input type="checkbox"/> 50 |
| Other <u>Flushed with water</u> | <input checked="" type="checkbox"/> |
3. Time spent developing well 510 min.
4. Depth of well (from top of well casing) 157.0 ft.
5. Inside diameter of well 2.00 in.
6. Volume of water in filter pack and well casing 10.1 gal.
7. Volume of water removed from well 1,280.0 gal.
8. Volume of water added (if any) 50.0 gal.
9. Source of water added City of Hudson
10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

| | Before Development | After Development |
|---|---|---|
| 11. Depth to Water (from top of well casing) | a. <u>131.80</u> ft. | <u>131.46</u> ft. |
| Date | b. <u>02/13/95</u> m m d d y y | <u>02/17/95</u> m m d d y y |
| Time | c. <u>10:45</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <u>3:30</u> <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m. |
| 12. Sediment in well bottom | <u>0.1</u> inches | <u>0.1</u> inches |
| 13. Water clarity | Clear <input type="checkbox"/> 10 Turbid <input checked="" type="checkbox"/> 15 (Describe) <u>very cloudy</u> | Clear <input type="checkbox"/> 20 Turbid <input type="checkbox"/> 25 (Describe) |
| * well installed by mud rotary Fill in if drilling fluids were used and well is at solid waste facility: | | |
| 14. Total suspended solids | _____ mg/l | _____ mg/l |
| 15. COD | _____ mg/l | _____ mg/l |

16. Additional comments on development:

well produced between 1:3 gpm during development over two days
pH and conductivity stabilized

Well developed by: Person's Name and Firm

Name: Rob Schaffer / Victor Praught
Firm: E.H. Renner & Sons, Inc.

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [Signature]
Print Initials: SAN
Firm: Wenck Associates, Inc.

| | | |
|--|---|---|
| Facility/Project Name JUNKER LANDFILL | Local Grid Location of Well _____ ft. <input type="checkbox"/> N. _____ ft. <input type="checkbox"/> E. _____ ft. <input type="checkbox"/> S. _____ ft. <input type="checkbox"/> W | Well Name WW-12 |
| City License, Permit or Monitoring Number _____ | Grid Origin Location Lat. _____ Long. _____ or _____ | Wis. Unique Well Number GT 506 DNR Well Number _____ |
| Type of Well Water Table Observation Well <input checked="" type="checkbox"/> 11 Piezometer <input type="checkbox"/> 12 | St. Plane 434053.8 ft. N. 132082.9 ft. E. | Date Well Installed 0 1 2 0 / 9 5 m m d d y y |
| Distance Well Is From Waste/Source Boundary _____ ft. | Section Location of Waste/Source SW 1/4 of SW 1/4 of Sec. 18 T. 29 N. R. 18 E. | Well Installed By: (Person's Name and Firm) ROB SHAFFER |
| Is Well A Point of Enforcement Std. Application? <input type="checkbox"/> Yes <input type="checkbox"/> No | Location of Well Relative to Waste/Source u <input checked="" type="checkbox"/> Upgradient s <input type="checkbox"/> Sidegradient d <input type="checkbox"/> Downgradient n <input type="checkbox"/> Not Known | E.H. RENNER & SONS, INC. |

| | |
|---|--|
| A. Protective pipe, top elevation _____ ft. MSL | 1. Cap and lock? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| B. Well casing, top elevation 1065.54 ft. MSL | 2. Protective cover pipe: a. Inside diameter: 4 in. b. Length: 6 ft. c. Material: Steel <input checked="" type="checkbox"/> 04 Other <input type="checkbox"/> |
| C. Land surface elevation 1063.5 ft. MSL | d. Additional protection? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe: _____ |
| D. Surface seal, bottom _____ ft. MSL or _____ ft. | 3. Surface seal: Bentonite <input type="checkbox"/> 30 Concrete <input checked="" type="checkbox"/> 01 Other <input type="checkbox"/> |
| 12. USCS classification of soil near screen: GP <input type="checkbox"/> GM <input type="checkbox"/> GC <input type="checkbox"/> GW <input type="checkbox"/> SW <input type="checkbox"/> SP <input type="checkbox"/> SM <input type="checkbox"/> SC <input type="checkbox"/> ML <input type="checkbox"/> MH <input type="checkbox"/> CL <input type="checkbox"/> CH <input type="checkbox"/> Bedrock <input checked="" type="checkbox"/> | 4. Material between well casing and protective pipe: Bentonite <input checked="" type="checkbox"/> 30 Annular space seal <input type="checkbox"/> Other <input checked="" type="checkbox"/> |
| 13. Sieve analysis attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 5. Annular space seal: a. Granular Bentonite <input type="checkbox"/> 33 b. 10 Lbs/gal mud weight ... Bentonite-sand slurry <input type="checkbox"/> 35 c. 2 Lbs/gal mud weight ... Bentonite slurry <input type="checkbox"/> 31 d. _____ % Bentonite ... Bentonite-cement grout <input type="checkbox"/> 50 e. _____ Ft ³ volume added for any of the above |
| 14. Drilling method used: Rotary <input checked="" type="checkbox"/> 50 Hollow Stem Auger <input type="checkbox"/> 41 Other <input type="checkbox"/> | f. How installed: Tremie <input checked="" type="checkbox"/> 01 Tremie pumped <input type="checkbox"/> 02 Gravity <input type="checkbox"/> 08 |
| 15. Drilling fluid used: Water <input type="checkbox"/> 02 Air <input type="checkbox"/> 01 Drilling Mud <input checked="" type="checkbox"/> 03 None <input type="checkbox"/> 99 | 6. Bentonite seal: a. Bentonite granules <input checked="" type="checkbox"/> 33 b. <input checked="" type="checkbox"/> 1/4 in. <input type="checkbox"/> 3/8 in. <input type="checkbox"/> 1/2 in. Bentonite pellets <input type="checkbox"/> 32 c. _____ Other <input type="checkbox"/> |
| Drilling additives used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 7. Fine sand material: Manufacturer, product name & mesh size a. UNIMIN 4030/2.4/.25 b. Volume added 1 ft ³ |
| Describe _____ | 8. Filter pack material: Manufacturer, product name and mesh size a. RED FLINT NO. 30 b. Volume added 14 ft ³ |
| 17. Source of water (attach analysis): E.H. RENNER & SONS, INC. | 9. Well casing: Flush threaded PVC schedule 40 <input type="checkbox"/> 23 Flush threaded PVC schedule 80 <input checked="" type="checkbox"/> 24 Other <input type="checkbox"/> |
| E. Bentonite seal, top _____ ft. MSL or 143.0 ft. | 10. Screen material: FLUSH THREAD PVC SCH 80 a. Screen type: Factory cut <input checked="" type="checkbox"/> 11 Continuous slot <input type="checkbox"/> 01 Other <input type="checkbox"/> |
| F. Fine sand, top _____ ft. MSL or 148.0 ft. | b. Manufacturer TIMCO c. Slot size: 0.10 in. d. Slotted length: 20.0 ft. |
| G. Filter pack, top _____ ft. MSL or 150.0 ft. | 11. Backfill material (below filter pack): None <input checked="" type="checkbox"/> 14 Other <input type="checkbox"/> |
| H. Screen joint, top _____ ft. MSL or 155.0 ft. | |
| I. Well bottom _____ ft. MSL or 175.0 ft. | |
| J. Filter pack, bottom _____ ft. MSL or 175.0 ft. | |
| K. Borehole, bottom _____ ft. MSL or 175.0 ft. | |
| L. Borehole, diameter 10.0 in. | |
| M. O.D. well casing 2.5 in. | |
| N. I.D. well casing 2.0 in. | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.
Signature *Rob Shaffer* Firm **E.H. RENNER & SONS, INC.**

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐

| | | |
|--|---------------------------------|---|
| Facility/Project Name <u>Junker Landfill</u> | County Name <u>St. Croix</u> | Well Name <u>WW-12</u> |
| Facility License, Permit or Monitoring Number _____ | County Code <u>56</u> | Wis. Unique Well Number <u>67506</u> |
| | | DNR Well Number _____ |

| | | Before Development | After Development |
|---|--|--|-------------------|
| 1. Can this well be purged dry? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | | |
| 2. Well development method | | | |
| surged with bailer and bailed | <input type="checkbox"/> 41 | | |
| surged with bailer and pumped | <input type="checkbox"/> 61 | | |
| surged with block and bailed | <input type="checkbox"/> 42 | | |
| surged with block and pumped | <input type="checkbox"/> 62 | | |
| surged with block, bailed and pumped | <input type="checkbox"/> 70 | | |
| compressed air | <input checked="" type="checkbox"/> 20 | | |
| bailed only | <input type="checkbox"/> 10 | | |
| pumped only | <input type="checkbox"/> 51 | | |
| pumped slowly | <input type="checkbox"/> 50 | | |
| Other | <input type="checkbox"/> | | |
| 3. Time spent developing well | <u>165</u> min. | | |
| 4. Depth of well (from top of well casing) | <u>177.0</u> ft. | | |
| 5. Inside diameter of well | <u>2.00</u> in. | | |
| 6. Volume of water in filter pack and well casing | <u>7.5</u> gal. | | |
| 7. Volume of water removed from well | <u>335.0</u> gal. | | |
| 8. Volume of water added (if any) | _____ gal. | | |
| 9. Source of water added | _____ | | |
| 10. Analysis performed on water added? | <input type="checkbox"/> Yes <input type="checkbox"/> No (If yes, attach results) | | |
| 11. Depth to Water (from top of well casing) | a. <u>158.20</u> ft. | <u>158.67</u> ft. | |
| Date | b. <u>01/24/95</u> m m d d y y | <u>01/24/95</u> m m d d y y | |
| Time | c. <u>8:15</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <u>11:00</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m. | |
| 12. Sediment in well bottom | _____ inches | _____ inches | |
| 13. Water clarity | Clear <input type="checkbox"/> 10 Turbid <input checked="" type="checkbox"/> 15 (Describe) <u>Cloudy</u> | Clear <input checked="" type="checkbox"/> 20 Turbid <input type="checkbox"/> 25 (Describe) | |
| * Well installed by mud rotary Fill in if drilling fluids were used and well is at solid waste facility: | | | |
| 14. Total suspended solids | _____ mg/l | _____ mg/l | |
| 15. COD | _____ mg/l | _____ mg/l | |

16. Additional comments on development:

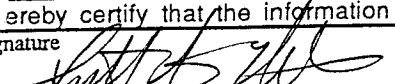
Well produced ~ 2 gpm during development
pH and Conductivity stabilized after 1.5 hrs of development
Water was clear at end of development

| | |
|---|--|
| Well developed by: Person's Name and Firm | I hereby certify that the above information is true and correct to the best of my knowledge. |
| Name: <u>Rob Schaffer</u> | Signature: <u>[Signature]</u> |
| Firm: <u>E.H. Renner & Sons, Inc.</u> | Print Initials: <u>SAN</u> |
| | Firm: <u>Wenck Associates, Inc.</u> |

| | | | | | |
|--|--|---|--|--|--|
| Facility/Project Name Junker Landfill | | Local Grid Location of Well _____ ft. <input type="checkbox"/> N. _____ ft. <input type="checkbox"/> E. _____ ft. <input type="checkbox"/> S. _____ ft. <input type="checkbox"/> W. | | Well Name WW-13 | |
| City License, Permit or Monitoring Number _____ | | Grid Origin Location Lat. _____ Long. _____ or _____ | | Wis. Unique Well Number DNR Well Number GT504 | |
| Type of Well Water Table Observation Well <input checked="" type="checkbox"/> 11 Piezometer <input type="checkbox"/> 12 | | St. Plane 433616.7 ft. N, 1321881.3 ft. E. | | Date Well Installed 01/13/95 m m d d y y | |
| Distance Well Is From Waste/Source Boundary _____ ft. | | Section Location of Waste/Source SE 1/4 of SE 1/4 of Sec. 13, T. 29 N, R. 19 E. | | Well Installed By: (Person's Name and Firm) Bryan Flicker/ Jeff Rustad | |
| Is Well A Point of Enforcement Std. Application? <input type="checkbox"/> Yes <input type="checkbox"/> No | | Location of Well Relative to Waste/Source u <input type="checkbox"/> Upgradient s <input checked="" type="checkbox"/> Sidegradient d <input type="checkbox"/> Downgradient n <input type="checkbox"/> Not Known | | North Star Drilling | |

| | | | |
|---|--|--|--|
| A. Protective pipe, top elevation _____ ft. MSL | | 1. Cap and lock? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | |
| B. Well casing, top elevation 1011.85 ft. MSL | | 2. Protective cover pipe: a. Inside diameter: 6.0 in. b. Length: 7.0 ft. c. Material: Steel <input checked="" type="checkbox"/> 04 Other <input type="checkbox"/> | |
| C. Land surface elevation 1010.3 ft. MSL | | d. Additional protection? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe: _____ | |
| D. Surface seal, bottom _____ ft. MSL or _____ ft. | | 3. Surface seal: Bentonite <input checked="" type="checkbox"/> 30 Concrete <input type="checkbox"/> 01 Other <input type="checkbox"/> | |
| 12. USCS classification of soil near screen: GP <input type="checkbox"/> GM <input type="checkbox"/> GC <input type="checkbox"/> GW <input type="checkbox"/> SW <input type="checkbox"/> SP <input type="checkbox"/> SM <input type="checkbox"/> SC <input type="checkbox"/> ML <input type="checkbox"/> MH <input type="checkbox"/> CL <input type="checkbox"/> CH <input type="checkbox"/> Bedrock <input checked="" type="checkbox"/> | | 4. Material between well casing and protective pipe: Bentonite <input checked="" type="checkbox"/> 30 Annular space seal <input type="checkbox"/> Other <input type="checkbox"/> | |
| 13. Sieve analysis attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | | 5. Annular space seal: a. Granular Bentonite <input type="checkbox"/> 33 b. 13 Lbs/gal mud weight ... Bentonite-sand slurry <input checked="" type="checkbox"/> 35 c. _____ Lbs/gal mud weight ... Bentonite slurry <input type="checkbox"/> 31 d. _____ % Bentonite ... Bentonite-cement grout <input type="checkbox"/> 50 e. _____ Ft ³ volume added for any of the above f. How installed: Tremie <input type="checkbox"/> 01 Tremie pumped <input checked="" type="checkbox"/> 02 Gravity <input type="checkbox"/> 08 | |
| 14. Drilling method used: Rotary <input type="checkbox"/> 50 Hollow Stem Auger <input type="checkbox"/> 41 Rotasonic Other <input checked="" type="checkbox"/> | | 6. Bentonite seal: a. Bentonite granules <input type="checkbox"/> 33 b. <input checked="" type="checkbox"/> 1/4 in. <input type="checkbox"/> 3/8 in. <input type="checkbox"/> 1/2 in. Bentonite pellets <input checked="" type="checkbox"/> 32 c. _____ Other <input type="checkbox"/> | |
| 15. Drilling fluid used: Water <input checked="" type="checkbox"/> 02 Air <input type="checkbox"/> 01 Drilling Mud <input type="checkbox"/> 03 None <input type="checkbox"/> 99 | | 7. Fine sand material: Manufacturer, product name & mesh size a. Unimin - 25 silica b. Volume added 3 ft ³ | |
| 16. Drilling additives used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | | 8. Filter pack material: Manufacturer, product name and mesh size a. Red Flint No. 30 b. Volume added 22 ft ³ | |
| Describe _____ | | 9. Well casing: Flush threaded PVC schedule 40 <input type="checkbox"/> 23 Flush threaded PVC schedule 80 <input checked="" type="checkbox"/> 24 Other <input type="checkbox"/> | |
| 17. Source of water (attach analysis): City of Hudson Public Works | | 10. Screen material: Sch. 80 PVC - 2" a. Screen type: Factory cut <input checked="" type="checkbox"/> 11 Continuous slot <input type="checkbox"/> 01 Other <input type="checkbox"/> | |
| E. Bentonite seal, top _____ ft. MSL or 95.0 ft. | | b. Manufacturer Timco c. Slot size: 0.010 in. d. Slotted length: 20.0 ft. | |
| F. Fine sand, top _____ ft. MSL or 100.0 ft. | | 11. Backfill material (below filter pack): None <input checked="" type="checkbox"/> 14 Other <input type="checkbox"/> | |
| G. Filter pack, top _____ ft. MSL or 103.0 ft. | | | |
| H. Screen joint, top _____ ft. MSL or 105.0 ft. | | | |
| I. Well bottom _____ ft. MSL or 125.0 ft. | | | |
| J. Filter pack, bottom _____ ft. MSL or 125.0 ft. | | | |
| K. Borehole, bottom _____ ft. MSL or 125.0 ft. | | | |
| L. Borehole, diameter 6.0 in. | | | |
| M. O.D. well casing 2.50 in. | | | |
| N. I.D. well casing 2.00 in. | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature  Firm **Wenck Associates, Inc. 2-15-95**

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis. Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than \$5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐

| | | |
|--|---------------------------------|---|
| Facility/Project Name <u>Junker Landfill</u> | County Name <u>St. Croix</u> | Well Name <u>WW-13</u> |
| Facility License, Permit or Monitoring Number _____ | County Code <u>56</u> | Wis. Unique Well Number <u>6T504</u> |
| | | DNR Well Number _____ |

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method

| | |
|--------------------------------------|--|
| surged with bailer and bailed | <input type="checkbox"/> 41 |
| surged with bailer and pumped | <input type="checkbox"/> 61 |
| surged with block and bailed | <input type="checkbox"/> 42 |
| surged with block and pumped | <input type="checkbox"/> 62 |
| surged with block, bailed and pumped | <input type="checkbox"/> 70 |
| compressed air | <input checked="" type="checkbox"/> 20 |
| bailed only | <input type="checkbox"/> 10 |
| pumped only | <input type="checkbox"/> 51 |
| pumped slowly | <input type="checkbox"/> 50 |
| Other <u>Flushed with water</u> | <input checked="" type="checkbox"/> |

3. Time spent developing well 150 min.

4. Depth of well (from top of well casing) 127.0 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 5.9 gal.

7. Volume of water removed from well 150.0 gal.

8. Volume of water added (if any) 25.0 gal.

9. Source of water added City of Hudson

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

| | Before Development | After Development |
|---|---|--|
| 11. Depth to Water (from top of well casing) | a. <u>112.42</u> ft. | <u>112.50</u> ft. |
| Date | b. <u>01/31/95</u> m m d d y y | <u>01/31/95</u> m m d d y y |
| Time | c. <u>12:30</u> <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m. | <u>3:00</u> <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m. |
| 12. Sediment in well bottom | <u>23.5</u> inches | <u><1.0</u> inches |
| 13. Water clarity | Clear <input type="checkbox"/> 10 Turbid <input checked="" type="checkbox"/> 15 (Describe) <u>cloudy, some fine sand present</u> | Clear <input checked="" type="checkbox"/> 20 Turbid <input type="checkbox"/> 25 (Describe) |
| * Well installed by mud rotary Fill in if drilling fluids were used and well is at solid waste facility: | | |
| 14. Total suspended solids | _____ mg/l | _____ mg/l |
| 15. COD | _____ mg/l | _____ mg/l |

16. Additional comments on development:
pH and Conductivity stable after 2 hrs. of development time.
Development drop pipe at 123' bgl.
Clear water after 2 hrs of development.

| | |
|---|--|
| Well developed by: Person's Name and Firm | I hereby certify that the above information is true and correct to the best of my knowledge. |
| Name: <u>Rob Schaffer</u> | Signature: <u>[Signature]</u> |
| Firm: <u>E.H. Renner & Sons, Inc.</u> | Print Initials: <u>SAN</u> |
| | Firm: <u>Wenck Associates, Inc.</u> |

| | | |
|--|--|---|
| Facility/Project Name JUNKER LANDFILL | Local Grid Location of Well ft. <input type="checkbox"/> N. <input type="checkbox"/> E. ft. <input type="checkbox"/> S. <input type="checkbox"/> W. | Well Name WW-14 |
| Utility License, Permit or Monitoring Number | Grid Origin Location Lat. _____ Long. _____ or | Wis. Unique Well Number G T 5 0 7 DNR Well Number |
| Type of Well Water Table Observation Well <input checked="" type="checkbox"/> 11 Piezometer <input type="checkbox"/> 12 | St. Plane 435539.0 ft. N. 1321281.1 ft. E. | Date Well Installed 0 1 3 0 / 9 5 m m d d y y |
| Distance Well Is From Waste/Source Boundary ft. | Section Location of Waste/Source NW 1/4 of SE 1/4 of Sec. 13, T. 29 N, R. 19 E. | Well Installed By: (Person's Name and Firm) ROB SHAFFER |
| Is Well A Point of Enforcement Std. Application? <input type="checkbox"/> Yes <input type="checkbox"/> No | Location of Well Relative to Waste/Source u <input type="checkbox"/> Upgradient s <input type="checkbox"/> Sidegradient d <input type="checkbox"/> Downgradient n <input type="checkbox"/> Not Known | E.H. RENNER & SONS, INC. |

| | |
|---|--|
| A. Protective pipe, top elevation _____ ft. MSL | 1. Cap and lock? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| B. Well casing, top elevation 970.75 ft. MSL | 2. Protective cover pipe: a. Inside diameter: 6 in. b. Length: _____ ft. c. Material: PROTECTIVE POSTS Steel <input checked="" type="checkbox"/> 04 Other <input type="checkbox"/> |
| C. Land surface elevation 968.8 ft. MSL | d. Additional protection? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe: _____ |
| D. Surface seal, bottom _____ ft. MSL or _____ ft. | 3. Surface seal: NEAT CEMENT Bentonite <input type="checkbox"/> 30 Concrete <input checked="" type="checkbox"/> 01 Other <input type="checkbox"/> |
| 12. USCS classification of soil near screen: GP <input type="checkbox"/> GM <input type="checkbox"/> GC <input type="checkbox"/> GW <input type="checkbox"/> SW <input type="checkbox"/> SP <input type="checkbox"/> SM <input type="checkbox"/> SC <input type="checkbox"/> ML <input type="checkbox"/> MH <input type="checkbox"/> CL <input type="checkbox"/> CH <input type="checkbox"/> Bedrock <input checked="" type="checkbox"/> | 4. Material between well casing and protective pipe: Bentonite <input checked="" type="checkbox"/> 30 Annular space seal <input type="checkbox"/> BENTONITE SAND SLURRY Other <input type="checkbox"/> |
| 13. Sieve analysis attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 5. Annular space seal: a. Granular Bentonite <input type="checkbox"/> 33 b. 10 Lbs/gal mud weight ... Bentonite-sand slurry <input checked="" type="checkbox"/> 35 c. 2 Lbs/gal mud weight ... Bentonite slurry <input type="checkbox"/> 31 d. _____ % Bentonite ... Bentonite-cement grout <input type="checkbox"/> 50 e. _____ Ft ³ volume added for any of the above f. How installed: Tremie <input type="checkbox"/> 01 Tremie pumped <input checked="" type="checkbox"/> 02 Gravity <input type="checkbox"/> 08 |
| 14. Drilling method used: Rotary <input checked="" type="checkbox"/> 50 Hollow Stem Auger <input type="checkbox"/> 41 Other <input type="checkbox"/> | 6. Bentonite seal: a. Bentonite granules <input type="checkbox"/> 33 b. <input checked="" type="checkbox"/> 1/4 in. <input type="checkbox"/> 3/8 in. <input type="checkbox"/> 1/2 in. Bentonite pellets <input checked="" type="checkbox"/> 32 c. _____ Other <input type="checkbox"/> |
| 15. Drilling fluid used: Water <input type="checkbox"/> 02 Air <input type="checkbox"/> 01 Drilling Mud <input checked="" type="checkbox"/> 03 None <input type="checkbox"/> 99 | 7. Fine sand material: Manufacturer, product name & mesh size a. UNIMIN 4030/2.4/.25 b. Volume added 1 ft ³ |
| 5. Drilling additives used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 8. Filter pack material: Manufacturer, product name and mesh size a. RED FLINT NO. 30 b. Volume added 6 ft ³ |
| Describe _____ | 9. Well casing: Flush threaded PVC schedule 40 <input type="checkbox"/> 23 Flush threaded PVC schedule 80 <input checked="" type="checkbox"/> 24 Other <input type="checkbox"/> |
| 17. Source of water (attach analysis): CITY OF HUDSON PUBLIC WORKS | 10. Screen material: FLUSH THREAD PVC SCH 80 a. Screen type: Factory cut <input checked="" type="checkbox"/> 11 Continuous slot <input type="checkbox"/> 01 Other <input type="checkbox"/> |
| E. Bentonite seal, top _____ ft. MSL or 60.0 ft. | b. Manufacturer TIMCO 10 in. c. Slot size: 20.0 in. d. Slotted length: _____ ft. |
| F. Fine sand, top _____ ft. MSL or 65.0 ft. | 11. Backfill material (below filter pack): None <input checked="" type="checkbox"/> 14 Other <input type="checkbox"/> |
| G. Filter pack, top _____ ft. MSL or 67.0 ft. | |
| H. Screen joint, top _____ ft. MSL or 72.0 ft. | |
| I. Well bottom _____ ft. MSL or 92.0 ft. | |
| J. Filter pack, bottom _____ ft. MSL or 92.0 ft. | |
| K. Borehole, bottom _____ ft. MSL or 92.0 ft. | |
| L. Borehole, diameter 5.9 in. | |
| M. O.D. well casing 2.5 in. | |
| N. I.D. well casing 2.0 in. | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.
Signature *Rob Shaffer* Firm **E.H. RENNER & SONS, INC..**

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis. Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than \$5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐

| | | |
|--|---------------------------------|---|
| Facility/Project Name <u>Junker Landfill</u> | County Name <u>St. Croix</u> | Well Name <u>WW-14</u> |
| Facility License, Permit or Monitoring Number _____ | County Code <u>56</u> | Wis. Unique Well Number <u>67507</u> |
| | | DNR Well Number _____ |

| | | Before Development | After Development |
|--|--|---|---|
| 1. Can this well be purged dry? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | | |
| 2. Well development method | | | |
| surged with bailer and bailed | <input type="checkbox"/> 41 | | |
| surged with bailer and pumped | <input type="checkbox"/> 61 | | |
| surged with block and bailed | <input type="checkbox"/> 42 | | |
| surged with block and pumped | <input type="checkbox"/> 62 | | |
| surged with block, bailed and pumped | <input type="checkbox"/> 70 | | |
| compressed air | <input checked="" type="checkbox"/> 20 | | |
| bailed only | <input type="checkbox"/> 10 | | |
| pumped only | <input type="checkbox"/> 51 | | |
| pumped slowly | <input type="checkbox"/> 50 | | |
| Other | <input type="checkbox"/> | | |
| 3. Time spent developing well | <u>170</u> min. | | |
| 4. Depth of well (from top of well casing) | <u>94.0</u> ft. | | |
| 5. Inside diameter of well | <u>2.00</u> in. | | |
| 6. Volume of water in filter pack and well casing | <u>9.6</u> gal. | | |
| 7. Volume of water removed from well | <u>170.0</u> gal. | | |
| 8. Volume of water added (if any) | _____ gal. | | |
| 9. Source of water added | _____ | | |
| 10. Analysis performed on water added? | <input type="checkbox"/> Yes <input type="checkbox"/> No (If yes, attach results) | | |
| 11. Depth to Water (from top of well casing) | | a. <u>70.00</u> ft. | <u>70.17</u> ft. |
| Date | | b. <u>01/31/95</u> m m d d y y | <u>01/31/95</u> m m d d y y |
| Time | | c. <u>8:00</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <u>10:50</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m. |
| 12. Sediment in well bottom | | <u>< 1.0</u> inches | <u>< 1.0</u> inches |
| 13. Water clarity | | Clear <input type="checkbox"/> 10 Turbid <input checked="" type="checkbox"/> 15 (Describe) <u>Slightly cloudy</u> | Clear <input checked="" type="checkbox"/> 20 Turbid <input type="checkbox"/> 25 (Describe) <u>Clear</u> |
| * Well was installed by mud rotary. Fill in if drilling fluids were used and well is at solid waste facility: | | | |
| 14. Total suspended solids | | _____ mg/l | _____ mg/l |
| 15. COD | | _____ mg/l | _____ mg/l |

16. Additional comments on development:

Well produced ~1 gpm during development.
Water was only slightly cloudy at beginning and clear after.
pH and Conductivity stabilized

Well developed by: Person's Name and Firm

Name: Rob Schaffer
Firm: E.H. Renner & Sons, Inc.

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [Signature]
Print Initials: S A N
Firm: Wenck Associates, Inc.

| | | |
|--|---|--|
| Facility/Project Name JUNKER LANDFILL | Local Grid Location of Well ft. <input type="checkbox"/> N. <input type="checkbox"/> E. ft. <input type="checkbox"/> S. <input type="checkbox"/> W. | Well Name WW-15A |
| Utility License, Permit or Monitoring Number | Grid Origin Location Lat. _____ Long. _____ or _____ | Wis. Unique Well Number GT 501 DNR Well Number _____ |
| Type of Well Water Table Observation Well <input checked="" type="checkbox"/> 11 Piezometer <input type="checkbox"/> 12 | St. Plane 436420.2 ft. N. 1311470.7 ft. E. | Date Well Installed 01/11/95 m m d d y y |
| Distance Well Is From Waste/Source Boundary ft. | Section Location of Waste/Source NE 1/4 of SE 1/4 of Sec. 15 T. 29 N. R. 19 E. W. | Well Installed By: (Person's Name and Firm) VICTOR PRAUGHT |
| Is Well A Point of Enforcement Std. Application? <input type="checkbox"/> Yes <input type="checkbox"/> No | Location of Well Relative to Waste/Source u <input type="checkbox"/> Upgradient s <input type="checkbox"/> Sidegradient d <input checked="" type="checkbox"/> Downgradient n <input type="checkbox"/> Not Known | E.H. RENNER & SONS, INC. |

| | |
|---|--|
| A. Protective pipe, top elevation _____ ft. MSL | 1. Cap and lock? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| B. Well casing, top elevation 924.29 ft. MSL | 2. Protective cover pipe: a. Inside diameter: 4 in. b. Length: 7.5 ft. c. Material: Steel <input checked="" type="checkbox"/> 04 Other <input type="checkbox"/> |
| C. Land surface elevation 922.3 ft. MSL | d. Additional protection? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe: Bumper Posts |
| D. Surface seal, bottom _____ ft. MSL or _____ ft. | 3. Surface seal: Bentonite <input type="checkbox"/> 30 Concrete <input type="checkbox"/> 01 Other <input checked="" type="checkbox"/> |
| 12. USCS classification of soil near screen: GP <input type="checkbox"/> GM <input type="checkbox"/> GC <input type="checkbox"/> GW <input type="checkbox"/> SW <input type="checkbox"/> SP <input type="checkbox"/> SM <input type="checkbox"/> SC <input type="checkbox"/> ML <input type="checkbox"/> MH <input type="checkbox"/> CL <input type="checkbox"/> CH <input type="checkbox"/> Bedrock <input checked="" type="checkbox"/> | 4. Material between well casing and protective pipe: Bentonite <input type="checkbox"/> 30 Annular space seal <input type="checkbox"/> Other <input checked="" type="checkbox"/> |
| 13. Sieve analysis attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 5. Annular space seal: a. Granular Bentonite <input type="checkbox"/> 33 b. 10 Lbs/gal mud weight . . . Bentonite-sand slurry <input checked="" type="checkbox"/> 35 c. 2 Lbs/gal mud weight Bentonite slurry <input type="checkbox"/> 31 d. _____ % Bentonite Bentonite-cement grout <input checked="" type="checkbox"/> 50 e. _____ Ft ³ volume added for any of the above f. How installed: Tremie <input type="checkbox"/> 01 Tremie pumped <input checked="" type="checkbox"/> 02 Gravity <input type="checkbox"/> 08 |
| 14. Drilling method used: Rotary <input checked="" type="checkbox"/> 50 Hollow Stem Auger <input type="checkbox"/> 41 Other <input type="checkbox"/> | 6. Bentonite seal: a. Bentonite granules <input type="checkbox"/> 33 b. <input checked="" type="checkbox"/> 1/4 in. <input type="checkbox"/> 3/8 in. <input type="checkbox"/> 1/2 in. Bentonite pellets <input type="checkbox"/> 32 c. _____ Other <input type="checkbox"/> |
| 15. Drilling fluid used: Water <input type="checkbox"/> 02 Air <input type="checkbox"/> 01 Drilling Mud <input checked="" type="checkbox"/> 03 None <input type="checkbox"/> 99 | 7. Fine sand material: Manufacturer, product name & mesh size a. UNIMIN 4030/2.4/.25 b. Volume added 1 ft ³ |
| Drilling additives used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 8. Filter pack material: Manufacturer, product name and mesh size a. RED FLINT NO. 30 b. Volume added 7 ft ³ |
| Describe _____ | 9. Well casing: Flush threaded PVC schedule 40 <input type="checkbox"/> 23 Flush threaded PVC schedule 80 <input checked="" type="checkbox"/> 24 Other <input type="checkbox"/> |
| 17. Source of water (attach analysis): E.H. RENNER & SONS, INC. | 10. Screen material: FLUSH THREAD PVC SCH 80 a. Screen type: Factory cut <input checked="" type="checkbox"/> 11 Continuous slot <input type="checkbox"/> 01 Other <input type="checkbox"/> |
| E. Bentonite seal, top _____ ft. MSL or 45.0 ft. | b. Manufacturer TIMCO c. Slot size: 10 in. d. Slotted length: 20.0 ft. |
| F. Fine sand, top _____ ft. MSL or 50.0 ft. | 11. Backfill material (below filter pack): None <input type="checkbox"/> 14 1 bag bentonite plug Other <input type="checkbox"/> |
| G. Filter pack, top _____ ft. MSL or 53.0 ft. | |
| H. Screen joint, top _____ ft. MSL or 55.0 ft. | |
| I. Well bottom _____ ft. MSL or 75.0 ft. | |
| J. Filter pack, bottom _____ ft. MSL or 76.0 ft. | |
| K. Borehole, bottom _____ ft. MSL or 78.0 ft. | |
| L. Borehole, diameter 6.5 in. | |
| M. O.D. well casing 2.5 in. | |
| N. I.D. well casing 2.0 in. | |

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐

| | | |
|--|---------------------------------|---|
| Facility/Project Name <u>Junker Landfill</u> | County Name <u>St. Croix</u> | Well Name <u>WW-15A</u> |
| Facility License, Permit or Monitoring Number _____ | County Code <u>56</u> | Wis. Unique Well Number <u>GT501</u> |
| | | DNR Well Number _____ |

| | | Before Development | After Development |
|---|---|---|---|
| 1. Can this well be purged dry? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | | |
| 2. Well development method | | | |
| surged with bailer and bailed | <input type="checkbox"/> 41 | | |
| surged with bailer and pumped | <input type="checkbox"/> 61 | | |
| surged with block and bailed | <input type="checkbox"/> 42 | | |
| surged with block and pumped | <input type="checkbox"/> 62 | | |
| surged with block, bailed and pumped | <input type="checkbox"/> 70 | | |
| compressed air | <input checked="" type="checkbox"/> 20 | | |
| bailed only | <input type="checkbox"/> 10 | | |
| pumped only | <input type="checkbox"/> 51 | | |
| pumped slowly | <input type="checkbox"/> 50 | | |
| Other <u>Flushed with water</u> | <input checked="" type="checkbox"/> | | |
| 3. Time spent developing well | <u>300</u> min. | | |
| 4. Depth of well (from top of well casing) | <u>78.0</u> ft. | | |
| 5. Inside diameter of well | <u>2.00</u> in. | | |
| 6. Volume of water in filter pack and well casing | <u>3.1</u> gal. | | |
| 7. Volume of water removed from well | <u>330.0</u> gal. | | |
| 8. Volume of water added (if any) | <u>50.0</u> gal. | | |
| 9. Source of water added | <u>City of Hudson</u> | | |
| 10. Analysis performed on water added? | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If yes, attach results) | | |
| 11. Depth to Water (from top of well casing) | | a. <u>70.17</u> ft. | <u>70.18</u> ft. |
| Date | | b. <u>02/01/95</u> m m d d y y | <u>02/13/95</u> m m d d y y |
| Time | | c. <u>4:00</u> <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m. | <u>3:30</u> <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m. |
| 12. Sediment in well bottom | | <u>216.0</u> inches | <u>0.1</u> inches |
| 13. Water clarity | | Clear <input type="checkbox"/> 10 Turbid <input checked="" type="checkbox"/> 15 (Describe) <u>very cloudy, sediment</u> | Clear <input checked="" type="checkbox"/> 20 Turbid <input type="checkbox"/> 25 (Describe) <u>clear</u> |
| * Well installed by mud rotary Fill in if drilling fluids were used and well is at solid waste facility: | | | |
| 14. Total suspended solids | | _____ mg/l | _____ mg/l |
| 15. COD | | _____ mg/l | _____ mg/l |

16. Additional comments on development:
well was full of rocks, etc. when development began. Sediment was removed by flushing with water.
pH and Conductivity stabilized during development
Well was developed over 2 days.

| | |
|---|--|
| Well developed by: Person's Name and Firm | I hereby certify that the above information is true and correct to the best of my knowledge. |
| Name: <u>Rob Schaffer</u> | Signature: <u>[Signature]</u> |
| Firm: <u>E.H. Renner & Sons, Inc.</u> | Print Initials: <u>SAN</u> |
| | Firm: <u>Wenck Associates, Inc.</u> |

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

| | | |
|--|---|---|
| Facility/Project Name JUNKER LANDFILL | Local Grid Location of Well _____ ft. <input type="checkbox"/> N. _____ ft. <input type="checkbox"/> E. _____ ft. <input type="checkbox"/> S. _____ ft. <input type="checkbox"/> W. | Well Name WW-15B |
| City License, Permit or Monitoring Number _____ | Grid Origin Location Lat. _____ Long. _____ or St. Plane 436424.1 ft. N. 1311470.0 ft. E. | Wis. Unique Well Number DNR Well Number G T 5 0 2 |
| Type of Well Water Table Observation Well <input checked="" type="checkbox"/> 11 Piezometer <input type="checkbox"/> 12 | Section Location of Waste/Source NE 1/4 of SE 1/4 of Sec. 15, T. 29 N, R. 19 E, W. | Date Well Installed 0 1 / 1 9 / 9 5 m m d d y y |
| Distance Well Is From Waste/Source Boundary _____ ft. | Location of Well Relative to Waste/Source u <input type="checkbox"/> Upgradient s <input type="checkbox"/> Sidegradient d <input checked="" type="checkbox"/> Downgradient n <input type="checkbox"/> Not Known | Well Installed By: (Person's Name and Firm) VICTOR PRAUGHT E.H. RENNER & SONS, INC. |
| Is Well A Point of Enforcement Std. Application? <input type="checkbox"/> Yes <input type="checkbox"/> No | | |

| | |
|---|---|
| A. Protective pipe, top elevation _____ ft. MSL | 1. Cap and lock? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| B. Well casing, top elevation 924.52 ft. MSL | 2. Protective cover pipe: a. Inside diameter: 6 in. b. Length: 80 ft. c. Material: Steel <input checked="" type="checkbox"/> 04 Other <input type="checkbox"/> |
| C. Land surface elevation 922.6 ft. MSL | d. Additional protection? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe: Bumper Posts |
| D. Surface seal, bottom _____ ft. MSL or _____ ft. | 3. Surface seal: NEAT CEMENT Bentonite <input type="checkbox"/> 30 Concrete <input type="checkbox"/> 01 Other <input checked="" type="checkbox"/> |
| 12. USCS classification of soil near screen: GP <input type="checkbox"/> GM <input type="checkbox"/> GC <input type="checkbox"/> GW <input type="checkbox"/> SW <input type="checkbox"/> SP <input type="checkbox"/> SM <input type="checkbox"/> SC <input type="checkbox"/> ML <input type="checkbox"/> MH <input type="checkbox"/> CL <input type="checkbox"/> CH <input type="checkbox"/> Bedrock <input checked="" type="checkbox"/> | 4. Material between well casing and protective pipe: Bentonite <input type="checkbox"/> 30 Annular space seal <input type="checkbox"/> BENTONITE SAND SLURRY Other <input checked="" type="checkbox"/> |
| 13. Sieve analysis attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 5. Annular space seal: a. Granular Bentonite <input type="checkbox"/> 33 b. 10 Lbs/gal mud weight ... Bentonite-sand slurry <input type="checkbox"/> 35 c. 2 Lbs/gal mud weight ... Bentonite slurry <input type="checkbox"/> 31 d. 2 % Bentonite ... Bentonite-cement grout <input type="checkbox"/> 50 e. _____ Ft ³ volume added for any of the above |
| 14. Drilling method used: Rotary <input type="checkbox"/> 50 Hollow Stem Auger <input type="checkbox"/> 41 Other <input type="checkbox"/> | f. How installed: Tremie <input type="checkbox"/> 01 Tremie pumped <input checked="" type="checkbox"/> 02 Gravity <input type="checkbox"/> 08 |
| 15. Drilling fluid used: Water <input type="checkbox"/> 02 Air <input type="checkbox"/> 01 Drilling Mud <input checked="" type="checkbox"/> 03 None <input type="checkbox"/> 99 | 6. Bentonite seal: a. Bentonite granules <input type="checkbox"/> 33 b. <input checked="" type="checkbox"/> 1/4 in. <input type="checkbox"/> 3/8 in. <input type="checkbox"/> 1/2 in. Bentonite pellets <input checked="" type="checkbox"/> 32 c. _____ Other <input type="checkbox"/> |
| 16. Drilling additives used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 7. Fine sand material: Manufacturer, product name & mesh size a. UNIMIN 4030/2.4/.25 b. Volume added 1 ft ³ |
| Describe _____ | 8. Filter pack material: Manufacturer, product name and mesh size a. RED FLINT NO. 30 b. Volume added 1 ft ³ |
| 17. Source of water (attach analysis): CITY OF HUDSON PUBLIC WORKS | 9. Well casing: Flush threaded PVC schedule 40 <input type="checkbox"/> 23 Flush threaded PVC schedule 80 <input checked="" type="checkbox"/> 24 Other <input type="checkbox"/> |
| E. Bentonite seal, top _____ ft. MSL or 117.0 ft. | 10. Screen material: FLUSH THREAD PVC SCH 80 a. Screen type: Factory cut <input checked="" type="checkbox"/> 11 Continuous slot <input type="checkbox"/> 01 Other <input type="checkbox"/> |
| F. Fine sand, top _____ ft. MSL or 122.0 ft. | b. Manufacturer TIMCO c. Slot size: 10 in. d. Slotted length: 20.0 ft. |
| G. Filter pack, top _____ ft. MSL or 129.0 ft. | 11. Backfill material (below filter pack): None <input checked="" type="checkbox"/> 14 Other <input type="checkbox"/> |
| H. Screen joint, top _____ ft. MSL or 131.0 ft. | |
| I. Well bottom _____ ft. MSL or 151.0 ft. | |
| J. Filter pack, bottom _____ ft. MSL or 151.0 ft. | |
| K. Borehole, bottom _____ ft. MSL or 151.0 ft. | |
| L. Borehole, diameter 6.25 in. | |
| M. O.D. well casing 2.5 in. | |
| N. I.D. well casing 2.0 in. | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.
Signature **E.H. Renner** Firm **E.H. RENNER & SONS, INC.**

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis. Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than \$5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐

| | | |
|--|---------------------------------|---|
| Facility/Project Name <u>Junker Landfill</u> | County Name <u>St. Croix</u> | Well Name <u>WW-15B</u> |
| Facility License, Permit or Monitoring Number _____ | County Code <u>56</u> | Wis. Unique Well Number <u>61503</u> |
| | | DNR Well Number _____ |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|-----------------------------|---|-----------------------------|------------------------------|-----------------------------|------------------------------|-----------------------------|--------------------------------------|-----------------------------|----------------|--|-------------|-----------------------------|-------------|-----------------------------|---------------|-----------------------------|---------------------------------|-------------------------------------|--|--------------------|---------------------|-------------------|------------------|------|-----------------------------------|--|--------------------------------|------|---|--|---|-----------------------------------|--|---|------------------------------------|------------|------------|--------------------|--|
| <p>1. Can this well be purged dry? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>2. Well development method</p> <table border="0"> <tr><td>surged with bailer and bailed</td><td><input type="checkbox"/> 41</td></tr> <tr><td>surged with bailer and pumped</td><td><input type="checkbox"/> 61</td></tr> <tr><td>surged with block and bailed</td><td><input type="checkbox"/> 42</td></tr> <tr><td>surged with block and pumped</td><td><input type="checkbox"/> 62</td></tr> <tr><td>surged with block, bailed and pumped</td><td><input type="checkbox"/> 70</td></tr> <tr><td>compressed air</td><td><input checked="" type="checkbox"/> 20</td></tr> <tr><td>bailed only</td><td><input type="checkbox"/> 10</td></tr> <tr><td>pumped only</td><td><input type="checkbox"/> 51</td></tr> <tr><td>pumped slowly</td><td><input type="checkbox"/> 50</td></tr> <tr><td>Other <u>Flushed with water</u></td><td><input checked="" type="checkbox"/></td></tr> </table> <p>3. Time spent developing well <u>180</u> min.</p> <p>4. Depth of well (from top of well casing) <u>153.0</u> ft.</p> <p>5. Inside diameter of well <u>2.00</u> in.</p> <p>6. Volume of water in filter pack and well casing <u>32.8</u> gal.</p> <p>7. Volume of water removed from well <u>360.0</u> gal.</p> <p>8. Volume of water added (if any) <u>50.0</u> gal.</p> <p>9. Source of water added <u>City of Hudson</u></p> <p>10. Analysis performed on water added? <input type="checkbox"/> Yes <input type="checkbox"/> No (If yes, attach results)</p> | surged with bailer and bailed | <input type="checkbox"/> 41 | surged with bailer and pumped | <input type="checkbox"/> 61 | surged with block and bailed | <input type="checkbox"/> 42 | surged with block and pumped | <input type="checkbox"/> 62 | surged with block, bailed and pumped | <input type="checkbox"/> 70 | compressed air | <input checked="" type="checkbox"/> 20 | bailed only | <input type="checkbox"/> 10 | pumped only | <input type="checkbox"/> 51 | pumped slowly | <input type="checkbox"/> 50 | Other <u>Flushed with water</u> | <input checked="" type="checkbox"/> | <p>11. Depth to Water (from top of well casing)</p> <table border="0"> <tr> <td>Before Development</td> <td>a. <u>71.34</u> ft.</td> <td>After Development</td> <td><u>71.34</u> ft.</td> </tr> <tr> <td>Date</td> <td>b. <u>02/03/95</u> m m d d y y</td> <td></td> <td><u>02/03/95</u> m m d d y y</td> </tr> <tr> <td>Time</td> <td>c. <u>8:00</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m.</td> <td></td> <td><u>11:00</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m.</td> </tr> </table> <p>12. Sediment in well bottom <u>3.0</u> inches</p> <p>13. Water clarity</p> <table border="0"> <tr> <td>Clear <input type="checkbox"/> 10</td> <td>Clear <input checked="" type="checkbox"/> 20</td> </tr> <tr> <td>Turbid <input checked="" type="checkbox"/> 15</td> <td>Turbid <input type="checkbox"/> 25</td> </tr> <tr> <td>(Describe)</td> <td>(Describe)</td> </tr> <tr> <td><u>very cloudy</u></td> <td></td> </tr> </table> <p>* Well was installed by mud rotary Fill in if drilling fluids were used and well is at solid waste facility:</p> <p>14. Total suspended solids _____ mg/l</p> <p>15. COD _____ mg/l</p> | Before Development | a. <u>71.34</u> ft. | After Development | <u>71.34</u> ft. | Date | b. <u>02/03/95</u> m m d d y y | | <u>02/03/95</u> m m d d y y | Time | c. <u>8:00</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m. | | <u>11:00</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m. | Clear <input type="checkbox"/> 10 | Clear <input checked="" type="checkbox"/> 20 | Turbid <input checked="" type="checkbox"/> 15 | Turbid <input type="checkbox"/> 25 | (Describe) | (Describe) | <u>very cloudy</u> | |
| surged with bailer and bailed | <input type="checkbox"/> 41 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| surged with bailer and pumped | <input type="checkbox"/> 61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| surged with block and bailed | <input type="checkbox"/> 42 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| surged with block and pumped | <input type="checkbox"/> 62 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| surged with block, bailed and pumped | <input type="checkbox"/> 70 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| compressed air | <input checked="" type="checkbox"/> 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| bailed only | <input type="checkbox"/> 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| pumped only | <input type="checkbox"/> 51 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| pumped slowly | <input type="checkbox"/> 50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other <u>Flushed with water</u> | <input checked="" type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Before Development | a. <u>71.34</u> ft. | After Development | <u>71.34</u> ft. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date | b. <u>02/03/95</u> m m d d y y | | <u>02/03/95</u> m m d d y y | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Time | c. <u>8:00</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m. | | <u>11:00</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Clear <input type="checkbox"/> 10 | Clear <input checked="" type="checkbox"/> 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Turbid <input checked="" type="checkbox"/> 15 | Turbid <input type="checkbox"/> 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (Describe) | (Describe) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <u>very cloudy</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

16. Additional comments on development:
 Well produced \approx 2 gpm during entire development period.
 Water was very cloudy at start and clear at end.
 pH and Conductivity stabilized after 2 hrs of development.
 Approximately 100 gallons of drilling fluid lost during installation.

| | |
|---|--|
| Well developed by: Person's Name and Firm | I hereby certify that the above information is true and correct to the best of my knowledge. |
| Name: <u>Rob Schaefer</u> | Signature: <u>[Signature]</u> |
| Firm: <u>E.H. Renner & Sons, Inc.</u> | Print Initials: <u>SA N</u> |
| | Firm: <u>Wenck Associates, Inc.</u> |

| | | |
|--|---|---|
| Facility/Project Name JUNKER LANDFILL | Local Grid Location of Well ft. <input type="checkbox"/> N. <input type="checkbox"/> S. <input type="checkbox"/> E. <input type="checkbox"/> W. | Well Name WW-15C |
| Utility License, Permit or Monitoring Number | Grid Origin Location Lat. _____ Long. _____ or _____ | Wis. Unique Well Number GT 503 DNR Well Number |
| Type of Well Water Table Observation Well <input type="checkbox"/> 11 Piezometer <input checked="" type="checkbox"/> 12 | St. Plane 436421.6 ft. N. 1311465.0 ft. E. | Date Well Installed 02/02/95 m m d d y y |
| Distance Well Is From Waste/Source Boundary ft. | Section Location of Waste/Source NE 1/4 of SE 1/4 of Sec. 15, T. 29 N, R. 19 E. | Well Installed By: (Person's Name and Firm) ROB SHAFFER |
| Is Well A Point of Enforcement Std. Application? <input type="checkbox"/> Yes <input type="checkbox"/> No | Location of Well Relative to Waste/Source u <input type="checkbox"/> Upgradient s <input type="checkbox"/> Sidegradient d <input checked="" type="checkbox"/> Downgradient n <input type="checkbox"/> Not Known | E.H. RENNER & SONS, INC. |

| | |
|---|---|
| A. Protective pipe, top elevation _____ ft. MSL | 1. Cap and lock? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| B. Well casing, top elevation 924.26 ft. MSL | 2. Protective cover pipe: a. Inside diameter: 6 in. b. Length: 90 ft. c. Material: Steel <input checked="" type="checkbox"/> 04 Other <input type="checkbox"/> |
| C. Land surface elevation 922.2 ft. MSL | d. Additional protection? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe: Bumper Posts |
| D. Surface seal, bottom _____ ft. MSL or _____ ft. | 3. Surface seal: Bentonite <input type="checkbox"/> 30 Concrete <input type="checkbox"/> 01 Other <input checked="" type="checkbox"/> |
| 12. USCS classification of soil near screen: GP <input type="checkbox"/> GM <input type="checkbox"/> GC <input type="checkbox"/> GW <input type="checkbox"/> SW <input type="checkbox"/> SP <input type="checkbox"/> SM <input type="checkbox"/> SC <input type="checkbox"/> ML <input type="checkbox"/> MH <input type="checkbox"/> CL <input type="checkbox"/> CH <input type="checkbox"/> Bedrock <input checked="" type="checkbox"/> | 4. Material between well casing and protective pipe: Bentonite <input type="checkbox"/> 30 Annular space seal <input type="checkbox"/> Other <input checked="" type="checkbox"/> |
| 13. Sieve analysis attached? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | 5. Annular space seal: a. Granular Bentonite <input type="checkbox"/> 33 b. 10 Lbs/gal mud weight ... Bentonite-sand slurry <input type="checkbox"/> 35 c. 2 Lbs/gal mud weight ... Bentonite slurry <input type="checkbox"/> 31 d. _____ % Bentonite ... Bentonite-cement grout <input type="checkbox"/> 50 e. _____ Ft ³ volume added for any of the above f. How installed: Tremie <input type="checkbox"/> 01 Tremie pumped <input checked="" type="checkbox"/> 02 Gravity <input type="checkbox"/> 08 |
| 14. Drilling method used: Rotary <input checked="" type="checkbox"/> 50 Hollow Stem Auger <input type="checkbox"/> 41 Other <input type="checkbox"/> | 6. Bentonite seal: a. Bentonite granules <input type="checkbox"/> 33 b. <input checked="" type="checkbox"/> 1/4 in. <input type="checkbox"/> 3/8 in. <input type="checkbox"/> 1/2 in. Bentonite pellets <input type="checkbox"/> 32 c. _____ Other <input type="checkbox"/> |
| 15. Drilling fluid used: Water <input type="checkbox"/> 02 Air <input type="checkbox"/> 01 Drilling Mud <input checked="" type="checkbox"/> 03 None <input type="checkbox"/> 99 | 7. Fine sand material: Manufacturer, product name & mesh size UNIMIN 4030/2.4/.25 |
| 16. Drilling additives used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | a. Volume added _____ ft ³ |
| Describe _____ | 8. Filter pack material: Manufacturer, product name and mesh size RED FLINT NO. 30 |
| 17. Source of water (attach analysis): CITY OF HUDSON PUBLIC WORKS | b. Volume added _____ ft ³ |
| E. Bentonite seal, top _____ ft. MSL or 169.0 ft. | 9. Well casing: Flush threaded PVC schedule 40 <input type="checkbox"/> 23 Flush threaded PVC schedule 80 <input checked="" type="checkbox"/> 24 Other <input type="checkbox"/> |
| F. Fine sand, top _____ ft. MSL or 174.0 ft. | 10. Screen material: FLUSH THREAD PVC SCH 80 |
| G. Filter pack, top _____ ft. MSL or 178.0 ft. | a. Screen type: Factory cut <input checked="" type="checkbox"/> 11 Continuous slot <input type="checkbox"/> 01 Other <input type="checkbox"/> |
| H. Screen joint, top _____ ft. MSL or 180.0 ft. | b. Manufacturer TIMCO |
| I. Well bottom _____ ft. MSL or 200.0 ft. | c. Slot size: 20.0 in. |
| J. Filter pack, bottom _____ ft. MSL or 200.0 ft. | d. Slotted length: _____ ft. |
| K. Borehole, bottom _____ ft. MSL or 200.0 ft. | 11. Backfill material (below filter pack): None <input checked="" type="checkbox"/> 14 Other <input type="checkbox"/> |
| L. Borehole, diameter 6.25 in. | |
| M. O.D. well casing 2.5 in. | |
| N. I.D. well casing 2.0 in. | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [Signature] Firm **E.H. RENNER & SONS, INC..**

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis. Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than \$5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐

| | | |
|--|---------------------------------|---|
| Facility/Project Name <u>Junker Landfill</u> | County Name <u>St. Croix</u> | Well Name <u>WW-15C</u> |
| Facility License, Permit or Monitoring Number _____ | County Code <u>56</u> | Wis. Unique Well Number <u>CT503</u> |
| | | DNR Well Number _____ |

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method

| | |
|--------------------------------------|--|
| surged with bailer and bailed | <input type="checkbox"/> 41 |
| surged with bailer and pumped | <input type="checkbox"/> 61 |
| surged with block and bailed | <input type="checkbox"/> 42 |
| surged with block and pumped | <input type="checkbox"/> 62 |
| surged with block, bailed and pumped | <input type="checkbox"/> 70 |
| compressed air | <input checked="" type="checkbox"/> 20 |
| bailed only | <input type="checkbox"/> 10 |
| pumped only | <input type="checkbox"/> 51 |
| pumped slowly | <input type="checkbox"/> 50 |
| Other _____ | <input type="checkbox"/> |

3. Time spent developing well 75 min.

4. Depth of well (from top of well casing) 202.0 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing 53.0 gal.

7. Volume of water removed from well 1,450.0 gal.

8. Volume of water added (if any) _____ gal.

9. Source of water added _____

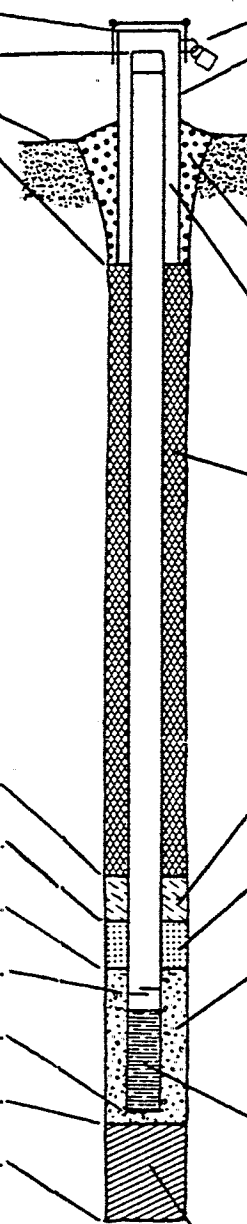
10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

| | Before Development | After Development |
|---|--|---|
| 11. Depth to Water (from top of well casing) | a. <u>69.91</u> ft. | <u>69.91</u> ft. |
| Date | b. <u>02/02/95</u> m m d d y y | <u>02/02/95</u> m m d d y y |
| Time | c. <u>10:15</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m. | <u>11:30</u> <input checked="" type="checkbox"/> a.m. <input type="checkbox"/> p.m. |
| 12. Sediment in well bottom | <u>< 1.0</u> inches | <u>< 1.0</u> inches |
| 13. Water clarity | Clear <input type="checkbox"/> 10 Turbid <input checked="" type="checkbox"/> 15 (Describe) <u>cloudy</u> | Clear <input checked="" type="checkbox"/> 20 Turbid <input type="checkbox"/> 25 (Describe) <u>clear</u> |
| * well installed by mud rotary Fill in if drilling fluids were used and well is at solid waste facility: | | |
| 14. Total suspended solids | _____ mg/l | _____ mg/l |
| 15. COD | _____ mg/l | _____ mg/l |

16. Additional comments on development:
well produced \approx 15 gpm during development
pH and Conductivity stabilized after 45 mins. of development time
water was cloudy to begin with and clear when completed.

| | |
|---|--|
| Well developed by: Person's Name and Firm | I hereby certify that the above information is true and correct to the best of my knowledge. |
| Name: <u>Rob Schaefer</u> | Signature: <u>[Signature]</u> |
| Firm: <u>E.H. Renner & Sons, Inc.</u> | Print Initials: <u>S A N</u> |
| | Firm: <u>Wenck Associates, Inc.</u> |

| | | | | | |
|--|--|---|--|--|--|
| Facility/Project Name JUNKER LANDFILL | | Local Grid Location of Well _____ ft. <input type="checkbox"/> N. _____ ft. <input type="checkbox"/> E. _____ ft. <input type="checkbox"/> S. _____ ft. <input type="checkbox"/> W. | | Well Name WW-16 | |
| City License, Permit or Monitoring Number _____ | | Grid Origin Location Lat. _____ Long. _____ or _____ | | Wis. Unique Well Number 61508 DNR Well Number _____ | |
| Type of Well Water Table Observation Well <input checked="" type="checkbox"/> 11 Piezometer <input type="checkbox"/> 12 | | St. Plane 434512.4 ft. N, 1311967.4 ft. E. | | Date Well Installed 03/02/95 m m d d y y | |
| Distance Well Is From Waste/Source Boundary _____ ft. | | Section Location of Waste/Source SW 1/4 of SW 1/4 of Sec. 14, T. 29N, R. 19E, W. | | Well Installed By: (Person's Name and Firm) VICTOR PRAUGHT | |
| Is Well A Point of Enforcement Std. Application? <input type="checkbox"/> Yes <input type="checkbox"/> No | | Location of Well Relative to Waste/Source u <input type="checkbox"/> Upgradient s <input type="checkbox"/> Sidegradient d <input checked="" type="checkbox"/> Downgradient n <input type="checkbox"/> Not Known | | E.H. RENNER & SONS, INC. | |

| | |
|--|--|
| <p>A. Protective pipe, top elevation _____ ft. MSL</p> <p>B. Well casing, top elevation 915.13 ft. MSL</p> <p>C. Land surface elevation 913.2 ft. MSL</p> <p>D. Surface seal, bottom _____ ft. MSL or _____ ft.</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>12. USCS classification of soil near screen:</p> <p>GP <input type="checkbox"/> GM <input type="checkbox"/> GC <input type="checkbox"/> GW <input type="checkbox"/> SW <input checked="" type="checkbox"/> SP <input type="checkbox"/> SM <input type="checkbox"/> SC <input type="checkbox"/> ML <input type="checkbox"/> MH <input type="checkbox"/> CL <input type="checkbox"/> CH <input type="checkbox"/> Bedrock <input type="checkbox"/></p> <p>13. Sieve analysis attached? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>14. Drilling method used: Rotary <input checked="" type="checkbox"/> 50 Hollow Stem Auger <input type="checkbox"/> 41 Other <input type="checkbox"/></p> <p>15. Drilling fluid used: Water <input type="checkbox"/> 02 Air <input type="checkbox"/> 01 Drilling Mud <input checked="" type="checkbox"/> 03 None <input type="checkbox"/> 99</p> <p>16. Drilling additives used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>Describe _____</p> <p>17. Source of water (attach analysis): E.H. RENNER & SONS, INC.</p> </div> <p>E. Bentonite seal, top _____ ft. MSL or 39.0 ft.</p> <p>F. Fine sand, top _____ ft. MSL or 44.0 ft.</p> <p>G. Filter pack, top _____ ft. MSL or 48.0 ft.</p> <p>H. Screen joint, top _____ ft. MSL or 50.0 ft.</p> <p>I. Well bottom _____ ft. MSL or 70.0 ft.</p> <p>J. Filter pack, bottom _____ ft. MSL or 70.0 ft.</p> <p>K. Borehole, bottom _____ ft. MSL or 92.0 ft.</p> <p>L. Borehole, diameter 6.0 in.</p> <p>M. O.D. well casing 2.5 in.</p> <p>N. I.D. well casing 2.0 in.</p> |  <p>1. Cap and lock? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>2. Protective cover pipe: a. Inside diameter: 6.0 in. b. Length: 6.0 ft. c. Material: Steel <input checked="" type="checkbox"/> 04 Other <input type="checkbox"/></p> <p>d. Additional protection? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe: _____</p> <p>3. Surface seal: Bentonite <input type="checkbox"/> 30 Concrete <input type="checkbox"/> 01 Other <input type="checkbox"/></p> <p>4. Material between well casing and protective pipe: Bentonite <input type="checkbox"/> 30 Annular space seal <input type="checkbox"/> Other <input type="checkbox"/></p> <p>5. Annular space seal: a. Granular Bentonite <input type="checkbox"/> 33 b. 10 Lbs/gal mud weight ... Bentonite-sand slurry <input type="checkbox"/> 35 c. 2 Lbs/gal mud weight ... Bentonite slurry <input type="checkbox"/> 31 d. _____ % Bentonite ... Bentonite-cement grout <input type="checkbox"/> 50 e. _____ Ft³ volume added for any of the above f. How installed: Tremie <input type="checkbox"/> 01 Tremie pumped <input checked="" type="checkbox"/> 02 Gravity <input type="checkbox"/> 08</p> <p>6. Bentonite seal: a. Bentonite granules <input type="checkbox"/> 33 b. <input type="checkbox"/> 1/4 in. <input type="checkbox"/> 3/8 in. <input type="checkbox"/> 1/2 in. Bentonite pellets <input type="checkbox"/> 32 c. _____ Other <input type="checkbox"/></p> <p>7. Fine sand material: Manufacturer, product name & mesh size a. UNIMIN 430/2.4/.25 b. Volume added 1 ft³</p> <p>8. Filter pack material: Manufacturer, product name and mesh size a. RED FLINT #30 b. Volume added 8 ft³</p> <p>9. Well casing: Flush threaded PVC schedule 40 <input type="checkbox"/> 23 Flush threaded PVC schedule 80 <input checked="" type="checkbox"/> 24 2" Other <input type="checkbox"/></p> <p>10. Screen material: FLUSH THREAD a. Screen type: Factory cut <input type="checkbox"/> 11 Continuous slot <input type="checkbox"/> 01 Other <input type="checkbox"/></p> <p>b. Manufacturer TIMCo c. Slot size: 0.040 in. d. Slotted length: 20.0 ft.</p> <p>11. Backfill material (below filter pack): None <input type="checkbox"/> 14 BENTONITE PELLETS Other <input type="checkbox"/></p> |
|--|--|

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature ROGER E. RENNER Firm ROGER E. RENNER, E.H. RENNER & SONS, INC.

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis. Stats., failure to file this form may result in a forfeiture of not less than \$10, nor more than \$5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than \$10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐

| | | |
|--|---------------------------------|---|
| Facility/Project Name <u>Junker Landfill</u> | County Name <u>St. Croix</u> | Well Name <u>WW-16</u> |
| Facility License, Permit or Monitoring Number _____ | County Code <u>56</u> | Wis. Unique Well Number <u>GT508</u> |
| | | DNR Well Number _____ |

1. Can this well be purged dry? ☐ Yes ☒ No
2. Well development method
- | | |
|--------------------------------------|--|
| surged with bailer and bailed | <input type="checkbox"/> 41 |
| surged with bailer and pumped | <input type="checkbox"/> 61 |
| surged with block and bailed | <input type="checkbox"/> 42 |
| surged with block and pumped | <input checked="" type="checkbox"/> 62 |
| surged with block, bailed and pumped | <input type="checkbox"/> 70 |
| compressed air | <input checked="" type="checkbox"/> 20 |
| bailed only | <input type="checkbox"/> 10 |
| pumped only | <input checked="" type="checkbox"/> 51 |
| pumped slowly | <input type="checkbox"/> 50 |
| Other _____ | <input type="checkbox"/> |
3. Time spent developing well 270 min.
4. Depth of well (from top of well casing) 72.0 ft.
5. Inside diameter of well 2.00 in.
6. Volume of water in filter pack and well casing 4.3 gal.
7. Volume of water removed from well 250.0 gal.
8. Volume of water added (if any) 20.0 gal.
9. Source of water added E.H. Renner & Sons, Inc.
10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

| | Before Development | After Development |
|---|--|--|
| 11. Depth to Water (from top of well casing) | a. <u>59.17</u> ft. | <u>59.16</u> ft. |
| Date | b. <u>03/03/95</u> m m d d y y | <u>03/08/95</u> m m d d y y |
| Time | c. <u>11:20</u> <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m. | <u>15:30</u> <input type="checkbox"/> a.m. <input checked="" type="checkbox"/> p.m. |
| 12. Sediment in well bottom | <u>< 0.1</u> inches | <u>< 0.1</u> inches |
| 13. Water clarity | Clear <input type="checkbox"/> 10 Turbid <input checked="" type="checkbox"/> 15 (Describe) <u>Moderate tan silty, cleared quickly</u> | Clear <input checked="" type="checkbox"/> 20 Turbid <input type="checkbox"/> 25 (Describe) |
| Fill in if drilling fluids were used and well is at solid waste facility: | | |
| 14. Total suspended solids | _____ mg/l | _____ mg/l |
| 15. COD | _____ mg/l | _____ mg/l |

16. Additional comments on development:
pH and conductivity stabilized during development

| | |
|--|--|
| Well developed by: Person's Name and Firm | I hereby certify that the above information is true and correct to the best of my knowledge. |
| Name: <u>Brian L. Holst / Victor Praught</u> | Signature: <u>[Signature]</u> |
| Firm: <u>Wenck Associates, Inc.</u> | Print Initials: <u>SAN</u> |
| <u>E.H. Renner & Sons, Inc.</u> | Firm: <u>Wenck Associates, Inc.</u> |

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

| | | | | | |
|--|--|---|--|---|--|
| Facility/Project Name Junker Landfill | | License/Permit/Monitoring Number _____ | | Boring Number WB-1 | |
| Boring Drilled By (Firm name and name of crew chief) North Star Drilling, Inc. - Bryan Flicker | | Date Drilling Started 01/12/95 M M D D Y Y | | Date Drilling Completed 01/13/95 M M D D Y Y | |
| DNR Facility Well No. _____ | | WI Unique Well No. GT504 | | Common Well Name WW-13 | |
| Final Static Water Level 111.50 Feet MSL^{TOC} | | Surface Elevation 1010.3 Feet MSL | | Borehole Diameter 6 inches | |
| Boring Location State Plane 433616.7 N, 132188.3 E S/C/N | | Lat 0 ' " | | Local Grid Location (If applicable) <input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W | |
| SE 1/4 of SE 1/4 of Section 13 , T 29 N, R 19 E (W) Long _____ | | County St. Croix | | DNR County Code 56 | |
| Civil Town/City/ or Village Hudson Township | | | | | |

| Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties | | | | | RQD/ Comments |
|-----------------|------------------------------|-------------|---------------|--|------|-------------|--------------|---------|----------------------|------------------|--------------|------------------|-------|---------------|
| | | | | | | | | | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | |
| Core | | NA | | Topsoil | | | | | | | | | | |
| | 5' | | 5' | Silt and clay, dk. brown to black, organic matter | OH | | | ND | | | | | | |
| | 5' | | 10' | sand, fine to med. gr., lt. brown | SP | | | ND | | | | | | |
| | 5' | | 15' | sand, med. to coarse gr., lt. brown | SW | | | ND | | | | | | |
| | 5' | | 20' | sand, fine to med. gr. and clay, lt. brown | SC | | | ND | | | | | | |
| | 5' | | 25' | | | | | ND | | | | | | |
| | 5' | | 30' | med. to coarse gr. sand and gravel, lt. brown, rounded | GP | | | ND | | | | | | |
| | 5' | | 35' | sand, fine to med. gr. and clay, lt. brown, hard | SC | | | ND | | | | | | |
| | 5' | | 40' | | | | | ND | | | | | | |
| | 5' | | 45' | fine to coarse gr. sand, rounded with trace fine gravel, lt. brown | SP | | | ND | | | | | | |
| | 5' | | 50' | | | | | ND | | | | | | |
| | 5' | | 55' | fine to med. gr. sand and silt, brown, very hard and dry | SM | | | ND | | | | | | |
| | 5' | | 60' | | | | | ND | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm **Wenck Associates, Inc.**

This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than \$10 nor more than \$5,000 for each violation. Fined not less than \$10 or more than \$100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

[illegible]

- ☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other

| | | | |
|--|--|---|---|
| Facility/Project Name Junker Landfill | | License/Permit/Monitoring Number _____ | Boring Number WB-2 |
| Boring Drilled By (Firm name and name of crew chief) North Star Drilling, Inc. - Bryan Flicker | | Date Drilling Started 01/11/95 M M D D Y Y | Date Drilling Completed 01/11/95 M M D D Y Y |
| DNR Facility Well No. WI Unique Well No. _____ | | Common Well Name _____ | Drilling Method Rotasonic |
| Final Static Water Level _____ Feet MSL | | Surface Elevation 1003.3 Feet MSL | Borehole Diameter 6 inches |
| Boring Location State Plane _____ N, _____ E S/C/N Lat _____ | | Local Grid Location (If applicable) <input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W | |
| SE 1/4 of SE 1/4 of Section 13 , T 29 N, R 19 E (W) Long _____ | | Feet _____ Feet _____ | |
| County St. Croix | | DNR County Code 56 | Civil Town/City/ or Village Hudson Township |

| Sample Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties | | | | | RQD/ Comments |
|------------------------------|---------------------------------|-------------|---------------|---|------|----------------|-----------------|---------|-------------------------|---------------------|-----------------|---------------------|-------|------------------|
| | | | | | | | | | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | |
| Core | 5' | NA | 5 | sand and gravel, fine to med. gr, poorly sorted, lt. brown | GP | | | ND | | | | | | |
| | 5' | | 10 | silty clay, lt. brown grading to greenish gray, med. stiffness | CL | | | ND | | | | | | |
| | 5' | | 15 | sand, fine to med. gr. with some med. to coarse gravel, lt. brown | SW | | | ND | | | | | | |
| | 5' | | 20 | sand, fine to med. gr, rounded, lt. brown | SP | | | ND | | | | | | |
| | 5' | | 25 | | | | | ND | | | | | | |
| | 5' | | 30 | | | | | ND | | | | | | |
| | 5' | | 35 | | | | | ND | | | | | | |
| | 5' | | 40 | sand, fine to med. gr., rounded with some med. to coarse gravel, occasional 2-3" cobble | SW | | | ND | | | | | | |
| | 5' | | 45 | sand, fine to med. gr, rounded, lt. brown; trace fine gravel | SP | | | ND | | | | | | |
| | 5' | | 50 | | | | | ND | | | | | | |
| | 5' | | 55 | sand, fine to med. gr., rounded, with some fine to med. gravel, lt. brown | SW | | | ND | | | | | | |
| | 5' | | 60 | | | | | ND | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm

Wenck Associates, Inc.

This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than \$10 nor more than \$5,000 for each violation. Fined not less than \$10 or more than \$100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

- ☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other _____

| | | | | | |
|--|--|--|--|---|--|
| Facility/Project Name <u>Junker Landfill</u> | | License/Permit/Monitoring Number _____ | | Boring Number <u>WB-3/</u> | |
| Boring Drilled By (Firm name and name of crew chief) <u>North Star Drilling, Inc. - Bryan Flicker</u> | | Date Drilling Started <u>01/14/95</u> MM DD YY | | Date Drilling Completed <u>01/14/95</u> MM DD YY | |
| DNR Facility Well No. _____ | | WI Unique Well No. _____ | | Common Well Name <u>N/A</u> | |
| Final Static Water Level <u>N/A</u> Feet MSL | | Surface Elevation <u>1012.5</u> Feet MSL | | Borehole Diameter <u>6</u> inches | |
| Boring Location State Plane _____ N, _____ E S/C/N | | Lat _____ | | Local Grid Location (If applicable) <input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W | |
| SE 1/4 of SE 1/4 of Section <u>13</u> , T <u>29</u> N, R <u>19</u> E/W | | Long _____ | | | |
| County <u>St. Croix</u> | | DNR County Code <u>5 6</u> | | Civil Town/City/ or Village <u>Hudson Township</u> | |

| Sample Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties | | | | | P 200 | RQD/ Comments |
|------------------------------|---------------------------------|-------------|---------------|---|------|----------------|-----------------|---------|-------------------------|---------------------|-----------------|---------------------|--|-------|------------------|
| | | | | | | | | | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | | | |
| | | NA | | Sand & gravel: Dark brown, well graded, unconsolidated. | SW | | | | 1.4/10 | | | | | | |
| | | | 10 | Clay: Dark gray, silty, highly plastic, some cobbles. | CH | | | | 0.8/10 | | | | | | |
| | | | 20 | Sand: Light brown, fine grained, subangular - subround, poorly graded. | SP | | | | 0.9/10 | | | | | | |
| | | | 30 | Gravel: Dark gray, 90% gravel, 0.5-2" diameter, wet, 10% silty fines. | GM | | | | 0.6/10 | | | | | | |
| | | | 40 | Silty Sand: Light brown, fine- very fine grained sand. | SM | | | | 0.7/10 | | | | | | |
| | | | 40 | Sand: Light brown, fine, moist. | SP | | | | 1.2/10 | | | | | | |
| | | | 50 | Sand: Fine to coarse, light brown, 10-15% pebbles or gravel, occasional cobble. | SP | | | | 0.3/10 | | | | | | |
| | | | 50 | Silt/Very Fine Sand: Light brown, dry, loose. | ML | | | | 2.0/10 | | | | | | |
| | | | 60 | Sand: Light brown, fine to coarse grained, <10% pebbles (0.2-0.5cm), Dry. | SP | | | | 0.2/30 | | | | | | |
| | | | 60 | | | | | | 0.3/14 | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Geoff H. Nash Firm WENCK ASSOCIATES, INC.

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- ☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other

| | | | | | |
|--|--|--|--|---|--|
| Facility/Project Name <u>Junker Landfill</u> | | License/Permit/Monitoring Number _____ | | Boring Number <u>WW-11</u> | |
| Boring Drilled By (Firm name and name of crew chief) <u>E.H. Renner & Sons, Inc. - Victor Praught</u> | | Date Drilling Started <u>02/01/95</u> M M D D Y Y | | Date Drilling Completed <u>02/08/95</u> M M D D Y Y | |
| DNR Facility Well No. <u>WT 505</u> | | Common Well Name <u>WW-11</u> | | Final Static Water Level <u>131.67 Feet MSL</u> | |
| Surface Elevation <u>1032.2 Feet MSL</u> | | Borehole Diameter <u>10" / 6" inches</u> | | Drilling Method <u>Rotary</u> | |
| Boring Location State Plane <u>433042.7</u> N, <u>1323035.3</u> E S/C/N Lat <u>0</u> ' " | | Local Grid Location (If applicable) <input type="checkbox"/> N <input type="checkbox"/> E <u>NW</u> 1/4 of <u>NW</u> 1/4 of Section <u>19</u> , T <u>29</u> N, R <u>18</u> E/W Long <u>0</u> ' " | | | |
| County <u>St. Croix</u> | | DNR County Code <u>56</u> | | Civil Town/City/ or Village <u>Hudson Township</u> | |

| Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties | | | | | RQD/ Comments |
|-----------------|------------------------------|-------------|---------------|--|------|-------------|--------------|---------|----------------------|------------------|--------------|------------------|-------|---------------|
| | | | | | | | | | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | |
| | | | 0 | Unconsolidated fine to coarse grained sand and gravel, poorly sorted | GP | | | | | | | | | |
| | | | 40 | | | | | | | | | | | |
| | | | 60 | | | | | | | | | | | |
| | | | 80 | | | | | | | | | | | |
| | | | 100 | | | | | | | | | | | |
| | | | 120 | | | | | | | | | | | |
| | | | 140 | Dolomite - Prairie du Chien | Opc | | | | | | | | | |
| | | | 160 | 155' EOB | | | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [Signature]

Firm Wenck Associates, Inc.

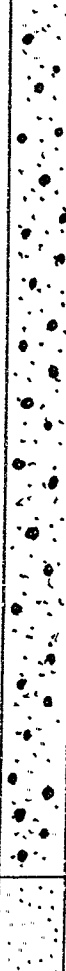

This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than \$10 nor more than \$5,000 for each violation. Fined not less than \$10 or more than \$100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

Route To:

- ☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other

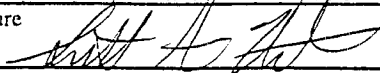
Page 1 of 2

| | | | | | |
|---|--|---|--|--|--|
| Facility/Project Name <u>Junker Landfill</u> | | License/Permit/Monitoring Number _____ | | Boring Number <u>WW-12</u> | |
| Boring Drilled By (Firm name and name of crew chief) <u>E.H. Renner & Sons, Inc. - Rob Shaffer</u> | | Date Drilling Started <u>01/19/95</u> M M D D Y Y | | Date Drilling Completed <u>01/20/95</u> M M D D Y Y | |
| DNR Facility Well No. <u>WT Unique Well No. <u>GT 506</u></u> | | Common Well Name <u>WW-12</u> | | Final Static Water Level <u>157.32</u> Feet MSL | |
| | | | | Surface Elevation <u>1063.5</u> Feet MSL | |
| | | | | Borehole Diameter <u>10</u> inches | |
| Boring Location State Plane <u>434053.8 N, 433616.7 E S/C/N</u> | | Lat <u>0</u> ' " | | Local Grid Location (If applicable) <input type="checkbox"/> N <input type="checkbox"/> E | |
| <u>SW</u> 1/4 of <u>SW</u> 1/4 of Section <u>18</u> , T <u>29</u> N, R <u>18</u> E/W | | Long _____ | | Feet <input type="checkbox"/> S _____ Feet <input type="checkbox"/> W | |
| County <u>St. Croix</u> | | DNR County Code <u>56</u> | | Civil Town/City/ or Village <u>Hudson Township</u> | |

| Sample Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties | | | | | RQD/ Comments |
|------------------------------|---------------------------------|-------------|--|---|------|--|-----------------|---------|-------------------------|---------------------|-----------------|---------------------|-------|------------------|
| | | | | | | | | | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | |
| | | | 10 20 30 40 50 60 70 80 90 100 110 | unconsolidated sand and gravel, fine to coarse gr., poorly sorted, lt. brown to brown in color | GP |  | | | | | | | | |
| | | | | St. Peter Sandstone fine to medium grained, poorly cemented sandstone, white to yellow | Osp |  | | | | | | | | |

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Signature



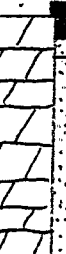



Firm

Wenck Associates, Inc.

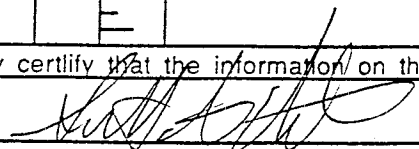
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| | | | | | |
|---|--|---|--|---|--|
| Facility/Project Name <u>Junker Landfill</u> | | License/Permit/Monitoring Number _____ | | Boring Number <u>WW-14</u> | |
| Boring Drilled By (Firm name and name of crew chief) <u>E.H. Renner & Sons, Inc. - Rob Shaffer</u> | | Date Drilling Started <u>01/26/95</u> M M D D Y Y | | Date Drilling Completed <u>01/30/95</u> M M D D Y Y | |
| DNR Facility Well No. <u>WT Unique Well No.</u> <u>GT 507</u> | | Common Well Name <u>WW-14</u> | | Final Static Water Level <u>72.61</u> Feet MSL | |
| | | | | Surface Elevation <u>968.8</u> Feet MSL | |
| | | | | Borehole Diameter <u>6 1/10</u> inches | |
| Boring Location State Plane <u>435539.0</u> N, <u>1321281.1</u> E S/C/N Lat <u>0</u> ' " | | Local Grid Location (If applicable) <input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W | | | |
| NW 1/4 of SE 1/4 of Section <u>13</u> , T <u>29</u> N, R <u>19</u> E/W Long _____ | | | | | |
| County <u>St. Croix</u> | | DNR County Code <u>56</u> | | Civil Town/City/ or Village <u>Hudson Township</u> | |

| Sample Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties | | | | | ROD/ Comments |
|------------------------------|---------------------------------|-------------|--|--|------|--|---|---------|-------------------------|---------------------|-----------------|---------------------|-------|------------------|
| | | | | | | | | | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | |
| | | | 10 20 30 40 50 60 70 80 90 | unconsolidated fine to coarse grained sand and gravel, poorly sorted | GP |  |  | | | | | | | |
| | | | | Dolomite - Prairie du Chien | Opc |  |  | | | | | | | |
| | | | | EOB 92' | | | | | | | | | | |

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- ☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other _____

| | | | | | |
|--|--|---|--|---|--|
| Facility/Project Name Junker Landfill | | License/Permit/Monitoring Number _____ | | Boring Number WW-15A | |
| Boring Drilled By (Firm name and name of crew chief) E.H. Renner & Sons, Inc. - Victor Praught | | Date Drilling Started 01/11/95 M M D D Y Y | | Date Drilling Completed 01/11/95 M M D D Y Y | |
| DNR Facility Well No. _____ | | WT Unique Well No. GT 501 | | Common Well Name WW-15A | |
| Final Static Water Level 70.26 Feet MSL | | Surface Elevation 922.3 Feet MSL | | Borehole Diameter 6" inches | |
| Boring Location State Plane 436420.2 N, 1311470.7 E S/C/N Lat 0 ' " | | Local Grid Location (If applicable) <input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W | | | |
| NE 1/4 of SE 1/4 of Section 15 , T 29 N, R 19 E(W) Long _____ | | Feet _____ Feet _____ | | | |
| County St. Croix | | DNR County Code 56 | | Civil Town/City/ or Village Hudson Township | |

| Sample | | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties | | | | | RQD/ Comments |
|--------------------|---------------------------------|-------------|---------------|--|------|----------------|-----------------|---------|-------------------------|---------------------|-----------------|---------------------|-------|------------------|
| Number and Type | Length Att. & Recovered (in) | | | | | | | | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | |
| | | | 10 | unconsolidated sand and gravel, fine to coarse gr., poorly sorted, brown | GP | | | | | | | | | |
| | | | 20 | | | | | | | | | | | |
| | | | 30 | | | | | | | | | | | |
| | | | 40 | soft, gray clay with some fine sand | Sc | | | | | | | | | |
| | | | 50 | | | | | | | | | | | |
| | | | 60 | | | | | | | | | | | |
| | | | 70 | Dolomite - Prairie du Chien | Opc | | | | | | | | | |
| | | | 80 | | | | | | | | | | | |
| | | | | EoB 78' | | | | | | | | | | |

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Route To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other

Page 1 of 2

| | | | | | |
|---|--|---|--|---|--|
| Facility/Project Name Junker Landfill | | License/Permit/Monitoring Number | | Boring Number WW-15B | |
| Boring Drilled By (Firm name and name of crew chief) E.H. Renner : Sons, Inc. - Victor Praught | | Date Drilling Started 01/12/95 M M D D Y Y | | Date Drilling Completed 01/19/95 M M D D Y Y | |
| DNR Facility Well No. WT Unique Well No. GT502 | | Common Well Name WW-15B | | Final Static Water Level 70.52 Feet MSL | |
| Surface Elevation 922.6 Feet MSL | | Borehole Diameter 10 1/6" inches | | Drilling Method Rotary | |
| Boring Location State Plane 436424.1 N, 1311470.0 E S/C/N Lat 0 ' " Long 0 ' " | | | | | |
| Local Grid Location (If applicable) <input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W | | | | | |
| County St. Croix DNR County Code 56 Civil Town/City/ or Village Hudson Township | | | | | |

| Sample | | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | U S C S | Graphic Log | Well Diagram | PID/FID | Soil Properties | | | | | P 200 | RQD/ Comments |
|--------------------|---------------------------------|-------------|---------------|---|---------|----------------|-----------------|---------|-------------------------|---------------------|-----------------|---------------------|--|-------|------------------|
| Number and Type | Length Att. & Recovered (in) | | | | | | | | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | | | |
| | | | 10 | unconsolidated sand and gravel, fine to coarse gr., poorly sorted | 6P | | | | | | | | | | |
| | | | 20 | | | | | | | | | | | | |
| | | | 30 | soft gray clay with some fine sand | SC | | | | | | | | | | |
| | | | 40 | | | | | | | | | | | | |
| | | | 50 | | | | | | | | | | | | |
| | | | 60 | Dolomite- Prairie du Chien | Dpc | | | | | | | | | | |
| | | | 70 | | | | | | | | | | | | |
| | | | 80 | | | | | | | | | | | | |
| | | | 90 | | | | | | | | | | | | |
| | | | 100 | | | | | | | | | | | | |
| | | | 110 | | | | | | | | | | | | |
| | | | 120 | | | | | | | | | | | | |

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- ☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other _____

| | | | | | |
|---|--|---|--|---|--|
| Facility/Project Name <u>Junker Landfill</u> | | License/Permit/Monitoring Number _____ | | Boring Number <u>WW-15C</u> | |
| Boring Drilled By (Firm name and name of crew chief) <u>E.H. Renner & Sons, Inc. - Rob Shaffer</u> | | Date Drilling Started <u>01/13/95</u> M M D D Y Y | | Date Drilling Completed <u>02/02/95</u> M M D D Y Y | |
| DNR Facility Well No. <u>WI Unique Well No. <u>GT503</u></u> | | Common Well Name <u>WW-15C</u> | | Final Static Water Level <u>70.24 Feet MSL</u> | |
| Surface Elevation <u>922.2 Feet MSL</u> | | Borehole Diameter <u>6"/10" inches</u> | | | |
| Boring Location State Plane <u>436421.6 N, 1311465.0 E S/C/N</u> | | Lat <u>0°</u> | | Local Grid Location (If applicable) <input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W | |
| NE 1/4 of SE 1/4 of Section <u>15</u> , T <u>29</u> N, R <u>19</u> E/W | | Long <u>0°</u> | | | |
| County <u>St. Croix</u> | | DNR County Code <u>56</u> | | Civil Town/City/ or Village <u>Hudson Township</u> | |

| Sample Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties | | | | | P 200 | RQD/ Comments |
|------------------------------|---------------------------------|-------------|---------------|---|------|----------------|-----------------|---------|-------------------------|---------------------|-----------------|---------------------|--|-------|------------------|
| | | | | | | | | | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | | | |
| | | | 10 | unconsolidated sand and gravel, fine to coarse gr., poorly sorted | GP | | | | | | | | | | |
| | | | 20 | | | | | | | | | | | | |
| | | | 30 | | | | | | | | | | | | |
| | | | 40 | soft, gray, clay with some fine sand | SC | | | | | | | | | | |
| | | | 50 | | | | | | | | | | | | |
| | | | 60 | | | | | | | | | | | | |
| | | | 70 | Dolomite - Prairie du Chien | Opc | | | | | | | | | | |
| | | | 80 | | | | | | | | | | | | |
| | | | 90 | | | | | | | | | | | | |
| | | | 100 | | | | | | | | | | | | |
| | | | 110 | | | | | | | | | | | | |
| | | | 120 | | | | | | | | | | | | |

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- ☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other

| | | | | | |
|--|--|--|--|---|--|
| Facility/Project Name Junker Landfill | | License/Permit/Monitoring Number — — — — — | | Boring Number WW-16 | |
| Boring Drilled By (Firm name and name of crew chief) E.H. Renner & Sons, Inc. - Victor Praught | | Date Drilling Started 03/02/95 M M D D Y Y | | Date Drilling Completed 03/02/95 M M D D Y Y | |
| DNR Facility Well No. — | | WI Unique Well No. GT508 | | Common Well Name WW-16 | |
| Final Static Water Level 59.5 Feet MSL | | Surface Elevation 913.2 Feet MSL | | Borehole Diameter 6" inches | |
| Boring Location State Plane 434512.4 N, 1311967.4 E S/C/N Lat 0 ° | | Local Grid Location (If applicable) <input type="checkbox"/> N <input type="checkbox"/> E SW 1/4 of SW 1/4 of Section 14 , T 29 N, R 19 E/W Long 0 ° | | | |
| County St. Croix | | DNR County Code 56 | | Civil Town/City/ or Village Hudson Township | |

| Sample Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties | | | | | RQD/ Comments |
|------------------------|------------------------------|-------------|---------------|---|------|-------------|--------------|---------|----------------------|------------------|--------------|------------------|-------|---------------|
| | | | | | | | | | Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | |
| | | | 10 | Sand, fine to coarse gr. and gravel, fine to coarse, subrounded, poorly sorted, brown | GP | | | | | | | | | |
| | | | 20 | | | | | | | | | | | |
| | | | 30 | | | | | | | | | | | |
| | | | 40 | | | | | | | | | | | |
| | | | 50 | | | | | | | | | | | |
| | | | 60 | | | | | | | | | | | |
| | | | 70 | Sand, fine to medium gr with some clay, occasional fragments of Op | SC | | | | | | | | | |
| | | | 80 | | | | | | | | | | | |
| | | | 90 | | | | | | | | | | | |
| | | | | EOB 92' | | | | | | | | | | |

Benton Pellet

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Signature Firm **Wenck Associates, Inc.**

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Appendix I

Geophysical Survey Results

SEISMIC REFRACTION SURVEY RESULTS

at the

JUNKER LANDFILL
Hudson, Wisconsin

Prepared for
Wenck Associates, Inc.

Davis-Wright Geophysical, Inc.
March 1995

Davis-Wright Geophysical, Inc.

Environmental Geophysics Consulting Services

March 8, 1995

Mr. Barry F. Power
Wenck Associates, Inc.
1800 Pioneer Creek Center
Maple Plain, MN 55359

**Subject: Results of Seismic Refraction Work,
Junker Landfill Site, Hudson, Wisconsin**

Dear Mr. Power:

Attached is the final report for the seismic refraction program conducted near the Junker Landfill in Hudson, Wisconsin.

Please give me a call at (612) 944-8662 if you have any questions or comments concerning this report. I appreciate the opportunity to work with you on this project.

Sincerely,



Philip A. Davis, CPG
President

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EXECUTIVE SUMMARY

Davis-Wright Geophysical acquired, processed, and interpreted two seismic refraction profiles covering a total of 7,440 line-feet, near the Junker Landfill in Hudson, Wisconsin (see Figure 1). The seismic program was conducted between December 20 and 23, 1994 as part of an environmental investigation by Wenck Associates, Inc. The purpose of the seismic work was to identify any buried valleys or other major features in the bedrock surface which might affect ground water flow. Because of the relatively shallow bedrock surface (typically less than 100 feet deep) and the pronounced increase in acoustic velocity at the interface between glacial overburden and dolomite bedrock (the Prairie du Chien Formation), seismic refraction was chosen as the most reliable geophysical approach.

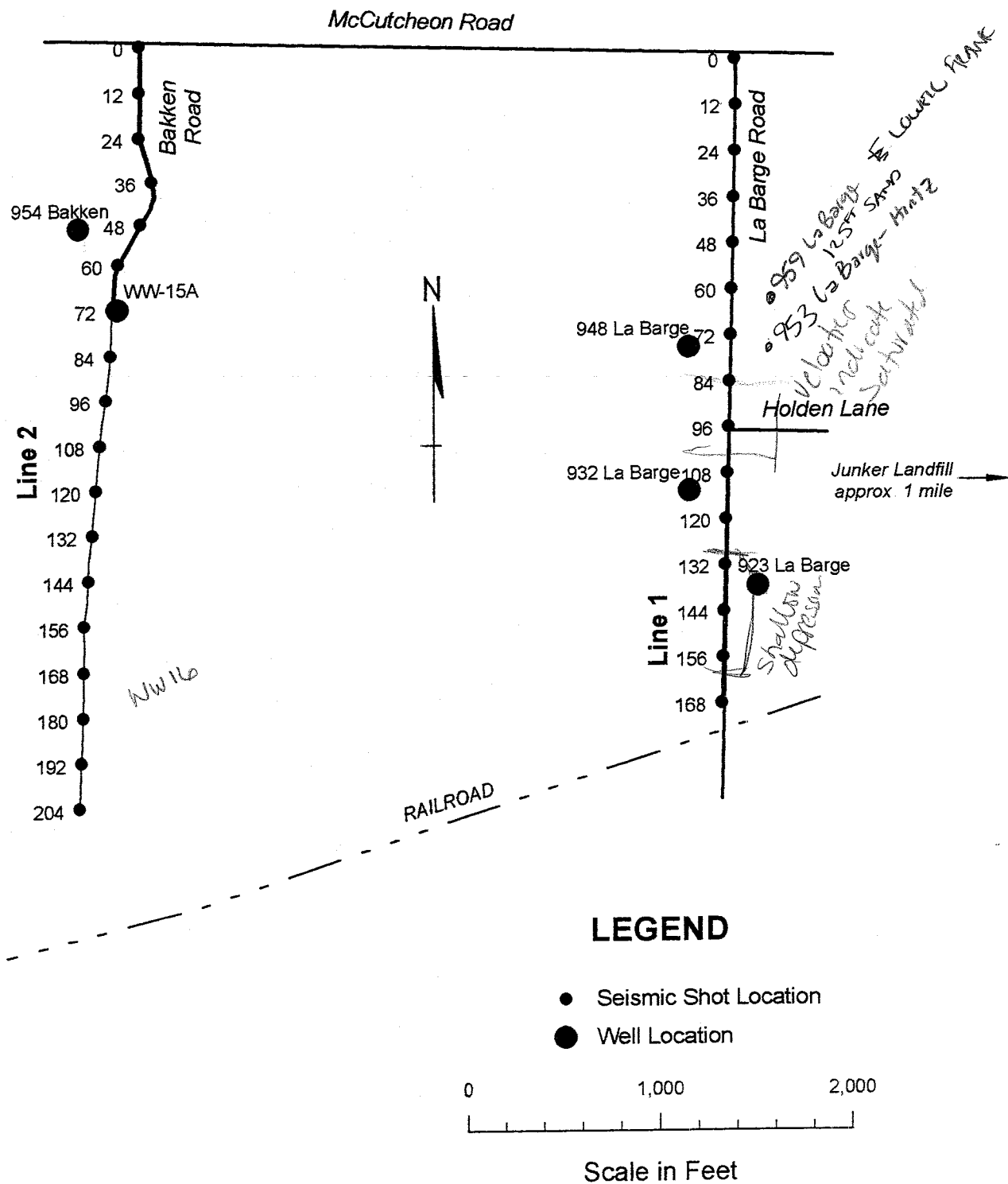
Seismic refraction involves the use of artificially-generated sound waves in the ground to measure the depth and acoustic velocity of subsurface layers. Data were recorded and processed using the Generalized Reciprocal Method, which produces a continuous profile of the refractor surface. Seismic measurements of surface and refractor velocities were used to calculate the refractor depth every 20 feet along each line. A follow-up topographic survey of the seismic source stations provided elevation control along the profile lines at 240-foot intervals.

The bedrock surface (Figures 2 and 3) appears generally flat, with calculated elevations ranging between 850 and 870 feet mean sea level. A graph of bedrock velocity is included with the elevation profiles. Areas of high velocity indicate hard, competent bedrock. Low velocities suggest highly-weathered dolomite bedrock or residual clay.

A comparison of the geophysical results with available residential well logs showed a good correlation in areas of high velocity bedrock. Discrepancies between the seismic results and drillers' logs in areas of low seismic velocity suggest that highly-weathered bedrock may have been mistaken for glacial overburden.

The only notable structural feature is a small depression in the bedrock surface near the south end of Line 1 (La Barge Road). Because no corresponding depression is evident on Line 2 there is no indication that the feature is a continuous channel. Based on the log of a nearby residential well, the base of this depression would be at approximately the same elevation as the water table. Thus, it appears likely that this feature would not significantly alter ground water flow.

Figure 1: Seismic Line Location Map
Junker Site, Hudson, Wisconsin
December 20-23, 1994



1 INTRODUCTION

Davis-Wright Geophysical, Inc. conducted a geophysical program consisting of two seismic refraction profiles, covering a total of 7,440 line-feet, west of the Junker Landfill in Hudson, Wisconsin. The program was undertaken as part of an environmental investigation effort conducted at the site by Wenck Associates, Inc. Field work for the project took place from December 20 to 23, 1994. Locations of the two profiles are shown in Figure 1.

1.1 Goal

The purpose of the seismic work was to locate and define any buried bedrock valleys or other major features in the bedrock surface which might affect ground water flow. To address this objective, both seismic refraction and seismic reflection were considered. Because of the relatively shallow bedrock surface (typically less than 100 feet deep) and the pronounced increase in acoustic velocity at the interface between glacial overburden and bedrock, seismic refraction was chosen as the most reliable approach.

1.2 Site Geology

The area surrounding the Junker Landfill is characterized by glacial outwash deposits overlying Ordovician carbonate (limestone and dolomite) deposits of the Prairie du Chien group. Depth to bedrock is typically less than 100 feet, but may vary locally due to the presence of buried alluvial channels or dissolution (sinkhole) features.

1.3 Methodology

Seismic refraction involves the use of artificially-generated sound waves in the ground to measure the depth and acoustic velocity of subsurface layers. The method differs from seismic reflection in that the configuration of geologic layers is inferred from the measurement of first-arrival travel times, whereas seismic reflection makes use of the full acoustic wave form. Sound waves are generated using either a weight drop (such as a sledgehammer) or compression source (such as an airgun or explosive). The vibrations are detected with moving-coil geophones, which transmit the resultant electrical pulses along a cable to a seismograph. A zero-time pulse is sent from the source to the seismograph to start the recording sequence. Data from the seismograph are downloaded onto a microcomputer for later processing.

Depth estimates based on refraction data are typically accurate to within 10% of total depth. While there may be some uncertainty associated with the overall depth of the refractor surface, the relative relief in the surface, as measured by refracted seismic waves, is very accurate. Thus, any interpreted structure, or especially lack of structure in the refractor surface will be reliable. Geologic logs from nearby wells provide a means with which to refine the overall depth interpretation.

GRM depth profiles typically show localized scatter which may be unrelated to actual variations in the refractor surface. This may be due to background noise on the seismic records, variations in near-surface velocity, or sharp changes in surface topography. The magnitude of this scatter is typically less than 5% of total depth, and does not affect the overall structural interpretation.

2 DATA ACQUISITION

2.1 Equipment

The seismic refraction program made use of the following equipment:

| | |
|---------------------|---|
| Seismograph: | Bison 9024, 24-channel floating point seismograph |
| Geophones: | Mark Products 30-Hertz |
| Cables: | C&M 12-channel (2) with 20-foot takeout interval |
| Source: | Bison EWG-1 mechanical weight drop (along roads); composite 24-pound sledgehammer (where vehicle access was restricted) |

2.2 Field Procedures

Field work began along Line 1 (see Figure 1) near the north end of La Barge Road on Tuesday, December 20, 1994. A total of 24 geophones were placed in the ground at 20-foot spacings (determined from computer modeling of reported geologic conditions). The EWG-1 seismic source was assembled and attached to the bumper of a field vehicle. An aluminum base plate was placed beneath the source to shorten the duration of the source pulse and to prevent damage to the road surface. A trigger switch was attached to the base plate and connected to the seismograph to start the recording of data.

The Bison 9024 seismograph was connected to the geophone array via two 12-channel cables. The seismic source was positioned on the west shoulder of La Barge Road, 10 feet north of the first geophone and 27 feet south of the center of McCutcheon Road (shot station 0, shown on Figure 1). A test shot was recorded to set gains and verify that geophone spacings and other field parameters were well suited to the survey objectives.

Data were recorded from shot positions at opposite ends of each geophone array position. An additional shot was recorded at the midpoint of the first and last geophone spreads to maximize the data at the end of each profile. After recording was finished at the first array position (three shot records), the back half of the geophone array was moved ahead (south) in a leap-frog fashion, with shots recorded at each end of the new array position. This process was repeated for the length of the line, producing a virtually continuous profile of formation velocities and refractor depth. A paper plot of each shot record was inspected in the field to maintain optimum quality.

Line 1 was terminated 144 feet north of the railroad crossing (shot station 168) due to an increase

in background noise near the railroad, likely due to vibrations transmitted from distant trains or industrial facilities along the tracks. Data from the final two geophone spreads (between shot stations 132 and 168) were difficult to interpret due to the noise. Field work was completed on Line 1 at approximately 1:00 PM on Wednesday, December 21. A total of 28 shot records were obtained on Line 1.

Refraction work on Line 2 was conducted in the same manner as Line 1. Work began near the north end of Bakken Road (shot station 0 was 16 feet south of the center of McCutcheon Road) and proceeded south. Because vehicle access was restricted beyond the end of Bakken Road (shot station 71) a 24-pound composite sledgehammer (two 12-pound hammers fastened together with hose clamps and tape) was used as the seismic source. Background noise was noticeably lower away from the road, so the quality of seismic data was actually better with the sledgehammer source than with the EWG-1.

Line 2 continued south for a total of 4,080 feet (to shot station 204). Seismic field work was completed at about 1:00 PM on Friday, December 23. A total of 34 shot records were obtained for Line 2. Following the completion of seismic work, wood lath was placed at each shot station and various additional points along both lines as markers for the topographic survey, which was conducted the following week.

3 DATA PROCESSING

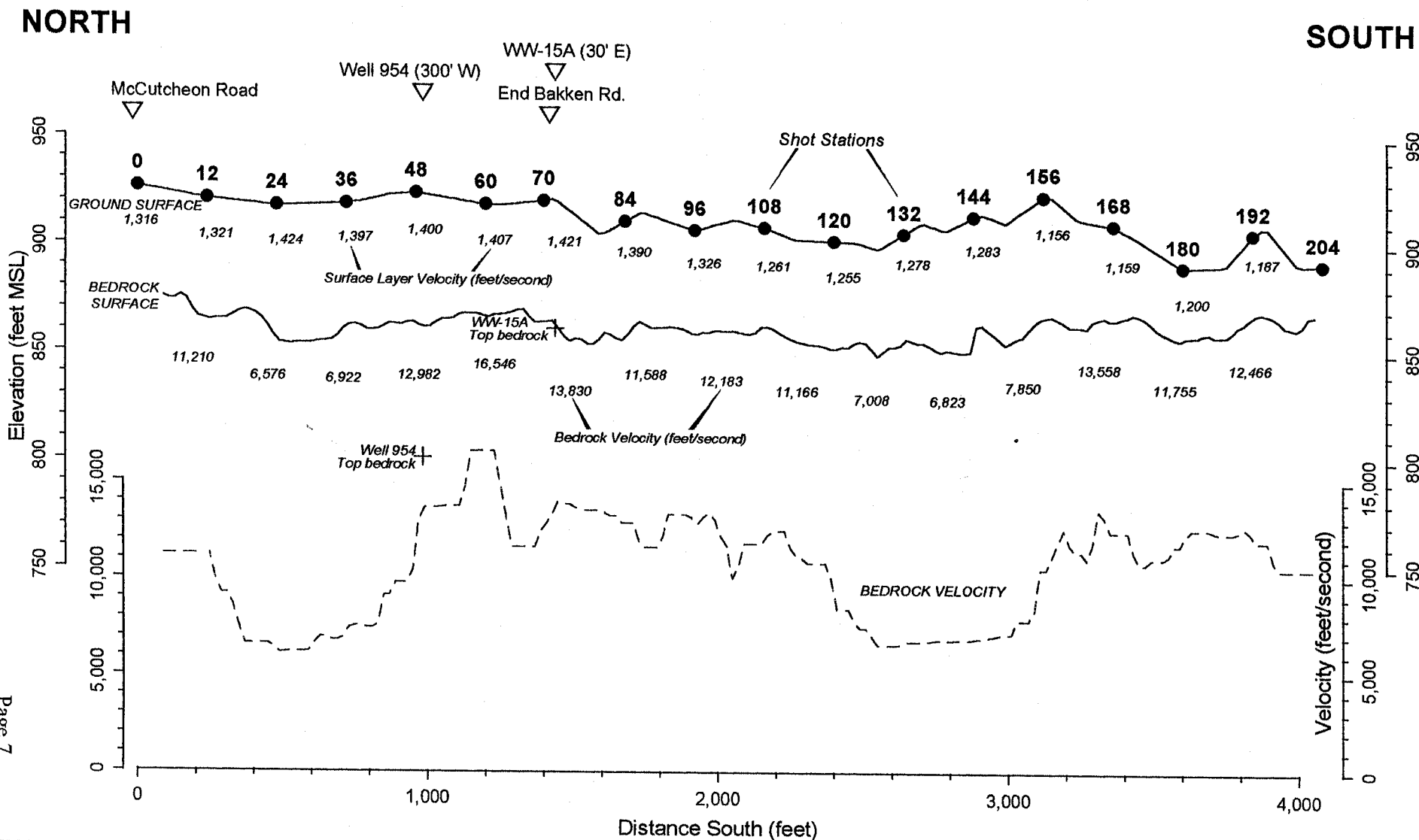
Seismic refraction data were acquired and processed using the Generalized Reciprocal Method (GRM). This method produces a measurement of target depth at each geophone position, allowing nearly continuous imaging of the refracting layer. The GRM method thus allows the definition of non-planar surfaces, such as buried channels, faults, and anticlines. This represents a major advance over more rudimentary plane-layer algorithms. The seismic data were processed on a 486-based microcomputer using "Firstpix" and "Gremix" software from Interpex, Ltd.

The GRM method produces a series of measurements called "timedepth", one at each geophone position. Timedepth roughly corresponds to the travel time of the seismic wave from the ground surface to the refractor surface, and is independent of measured velocities. Timedepth measurements can be used to detect inconsistencies in the interpreted depths, such as artificial structure created by incorrect velocities.

Timedepth measurements were converted to depth based on the seismic measurements of overlying layer velocities. Surveyed elevations along the two profiles were used to convert the depth profiles to elevation. Figures 2 and 3 show the resulting graphs of the bedrock surface elevation for lines 1 and 2.

LINE 2 Elevation (Bakken Road)

Figure 3: Seismic Refraction Profile #2
Bakken Road Depth Profile
Junker Site, Hudson, Wisconsin
December 20-23, 1994

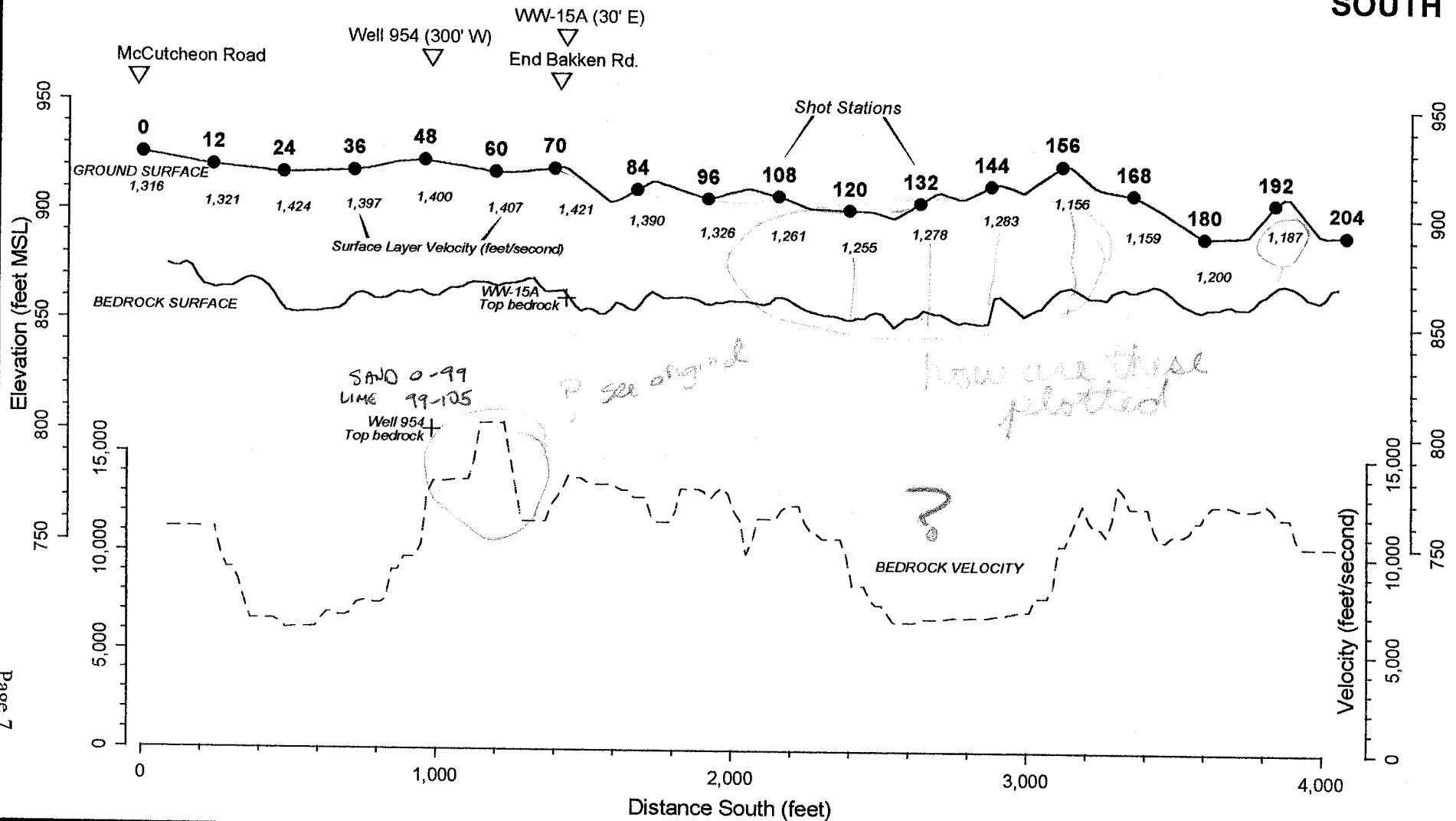


LINE 2 Elevation (Bakken Road)

Figure 3: Seismic Refraction Profile #2
Bakken Road Depth Profile
 Junker Site, Hudson, Wisconsin
 December 20-23, 1994

NORTH

SOUTH

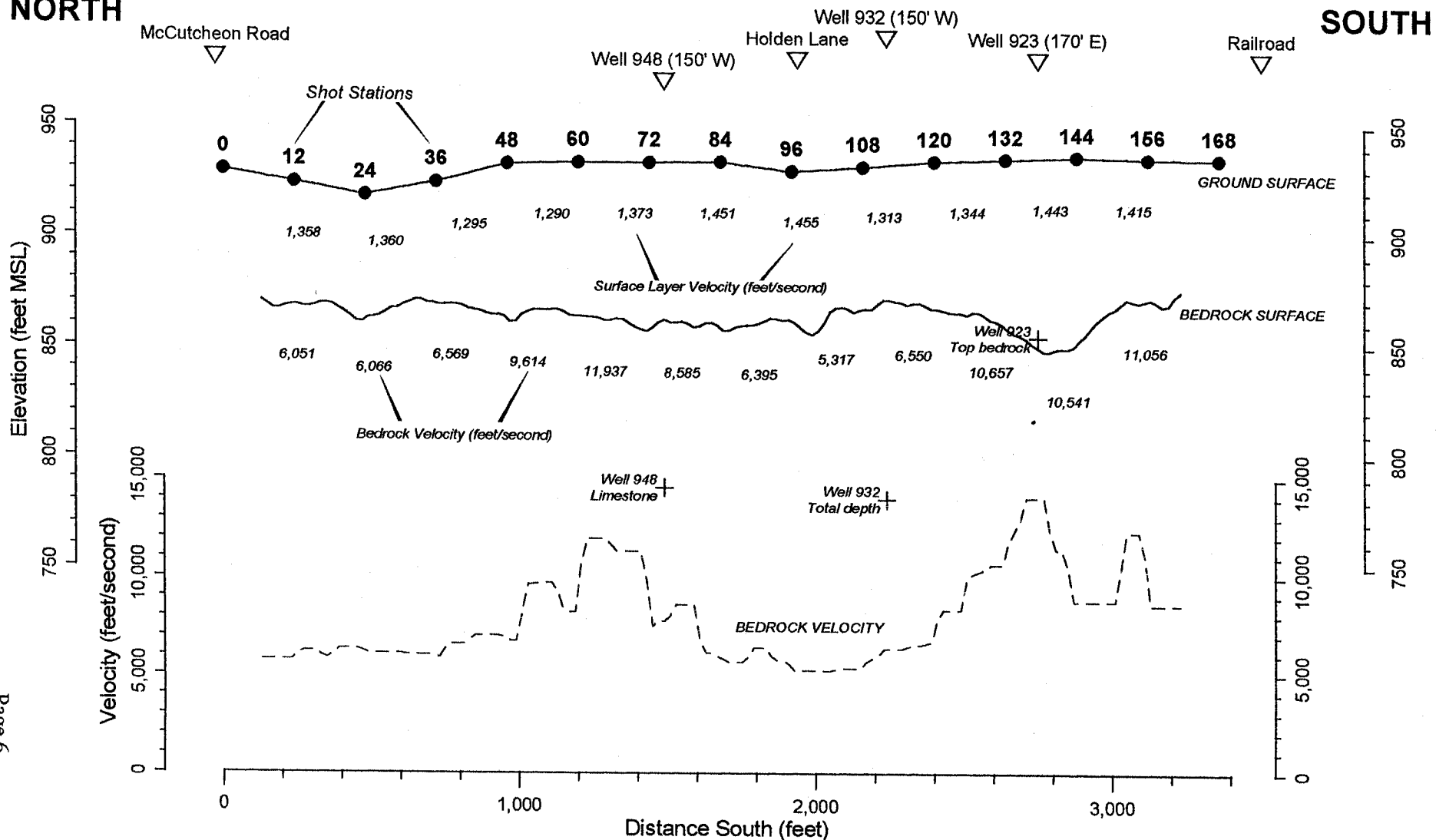


LINE 1 Elevation (La Barge Road)

Figure 2: Seismic Refraction Profile #1
La Barge Road Depth Profile
Junker Site, Hudson, Wisconsin
December 20-23, 1994

NORTH

SOUTH



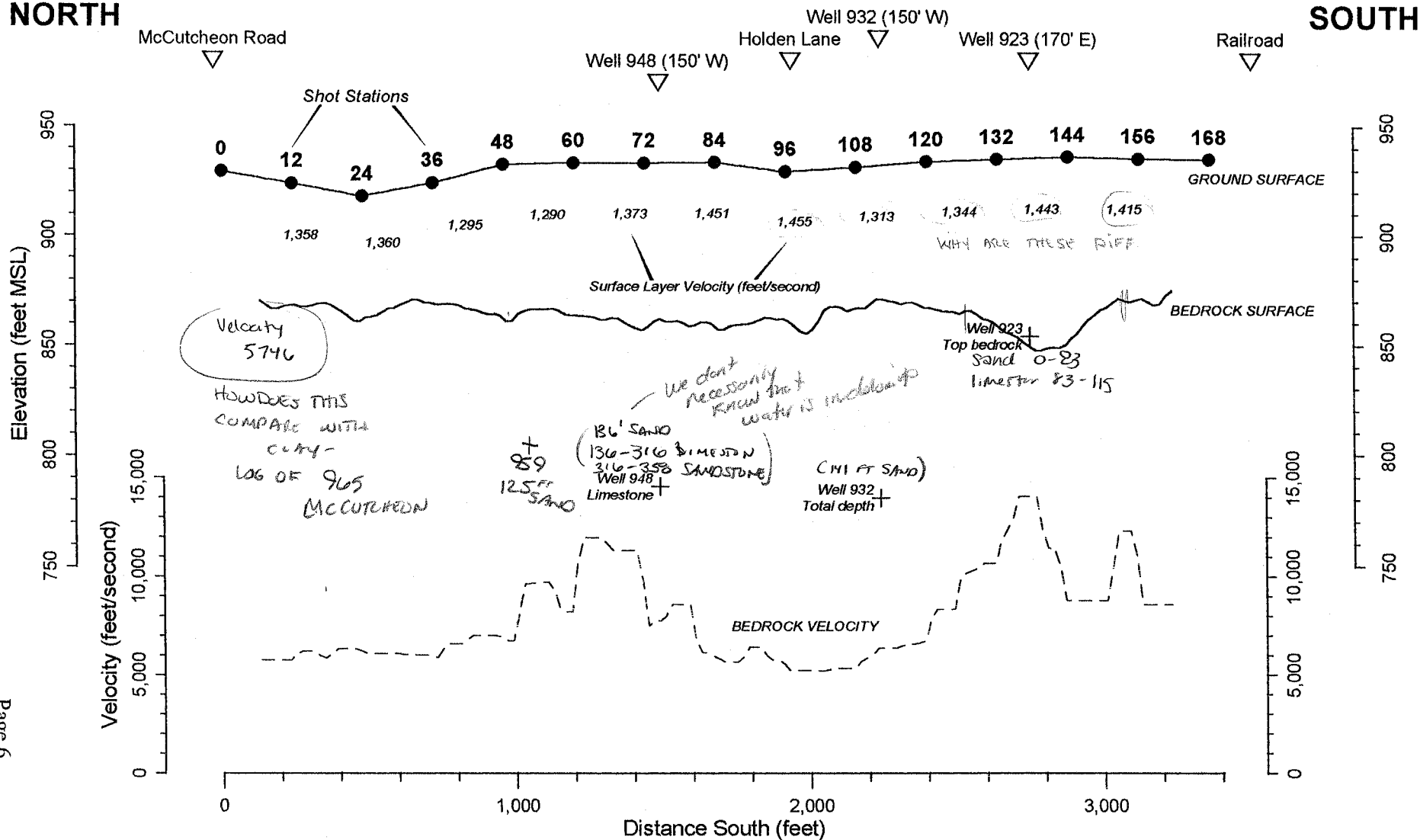
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LINE 1 Elevation (La Barge Road)

Figure 2: Seismic Refraction Profile #1
La Barge Road Depth Profile
Junker Site, Hudson, Wisconsin
December 20-23, 1994

NORTH

SOUTH



LINE 2: Bakken Road

Figure 3: Seismic Refraction Profile #2
Bakken Road Depth Profile
Nor-Lake Site, Hudson, Wisconsin
December 22-23, 1994

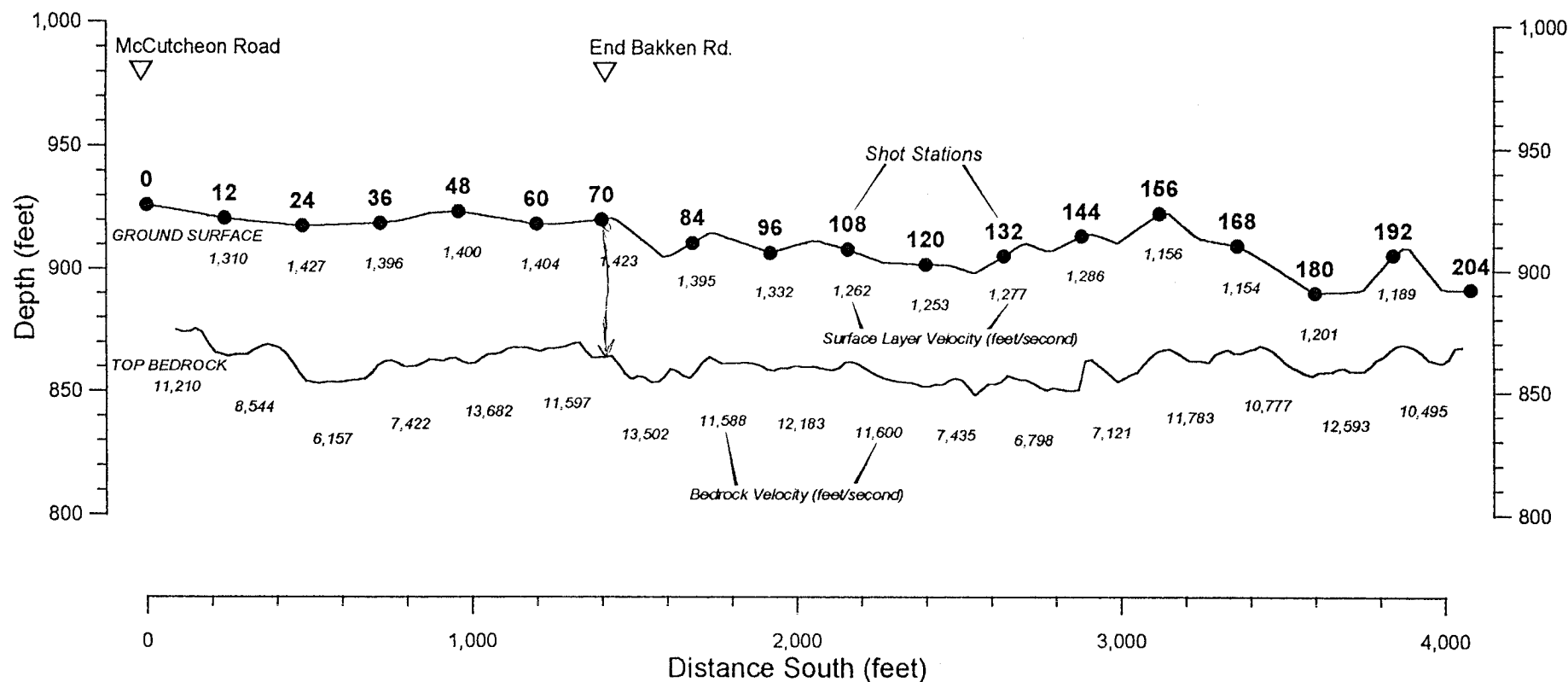


Figure 1: Seismic Line Location Map
Nor-Lake Site, Hudson, Wisconsin
December 20-23, 1994

DRAFT

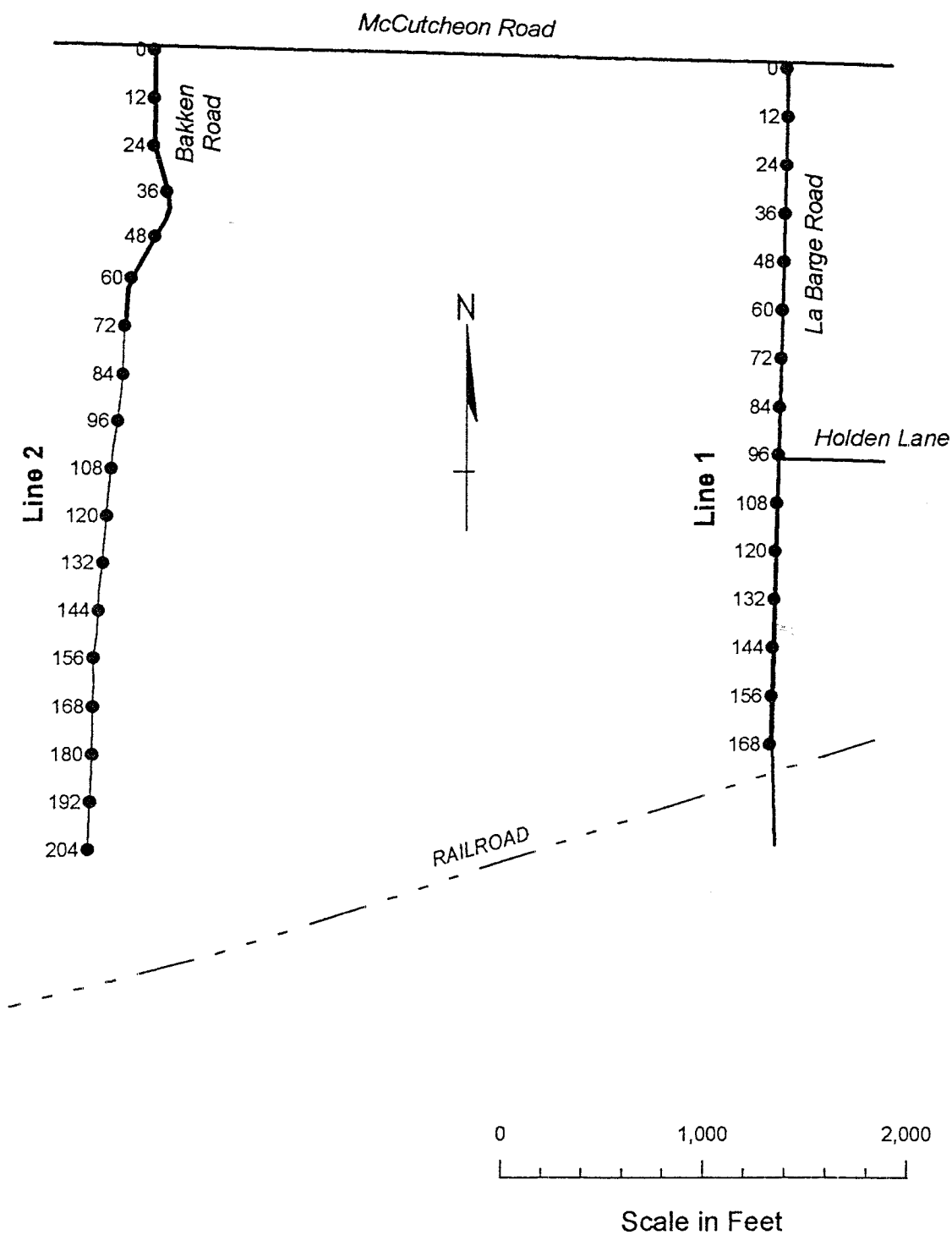
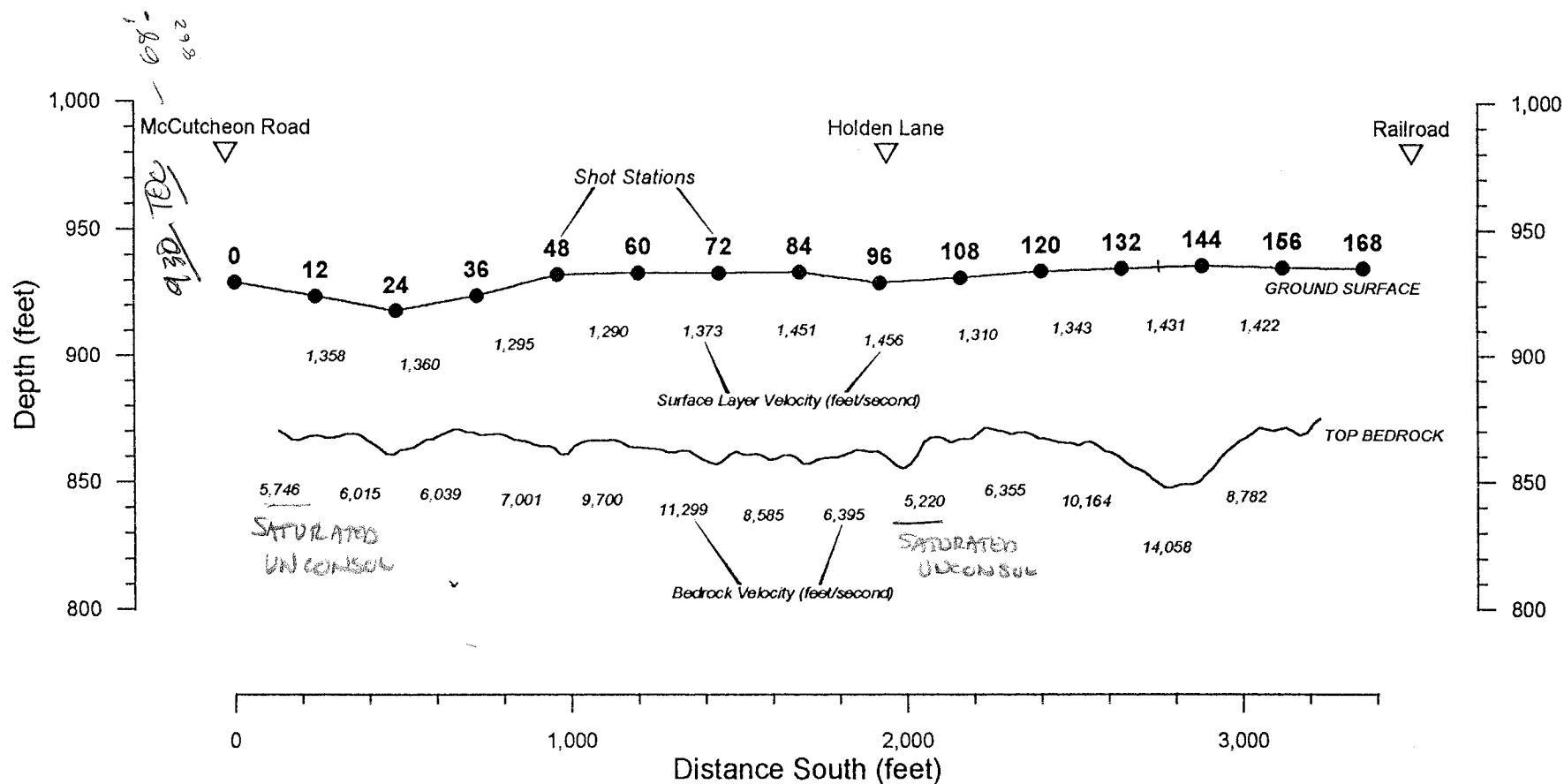


Figure 2: Seismic Refraction Profile #1
La Barge Road Depth Profile
Nor-Lake Site, Hudson, Wisconsin
December 20-21, 1994



4 INTERPRETATION

4.1 Seismic Elevation Profiles

Figures 2 and 3 are graphs of ground surface and bedrock surface elevations for Lines 1 and 2. The calculated seismic velocity of the surface layer is annotated at intervals along each line. A graph of refractor velocity is shown beneath the elevation profile. Surface-layer velocities range from about 1,200 to 1,450 feet per second (fps), which is typical of dry, unconsolidated sediments. Measured refractor velocities range from about 6,000 to over 14,000 fps. The seismic velocity of competent limestone or dolomite bedrock (such as the Prairie du Chien Formation) typically exceeds 12,000 fps. Velocities between 8,000 and 12,000 fps are typical of weathered carbonates or unweathered sandstone (such as the St. Peter Sandstone). Velocities between 6,000 and 8,000 fps probably indicate highly weathered bedrock or clay residuum, while velocities between 5,000 and 5,500 fps would be typical of saturated unconsolidated sands or gravels.

The two elevation profiles show the bedrock surface varying between 850 and 870 feet mean sea level (msl). The bedrock appears generally flat (the graphs have a vertical exaggeration of 7.5 to 1) with only minor localized variation. A broad, shallow depression is evident near the south end of Line 1 (Figure 2) between shot stations 130 and 150. Since no corresponding depression is evident on Line 2 (Figure 3), there is no indication that this depression represents an alluvial channel or other continuous east-west trending feature. Also, the relative depth of this depression (approximately 20 feet) would not be sufficient to significantly alter the flow of ground water in the area.

4.2 Well Control

Geologic information from four residential wells and one monitoring well within three hundred feet of the seismic lines was provided by Wenck Associates, Inc. The reported bedrock surface elevations, or well-bottom elevations where bedrock was not encountered, are plotted on the profiles in Figures 2 and 3. Logs of all five wells are included in the Appendix.

Line 1

The log of the residential well at 923 La Barge Road, about 170 feet east of Line 1 at station 137.5, shows the bedrock surface at an elevation of approximately 854 feet msl, which is within five feet of the seismic-calculated bedrock surface elevation at station 137.5 (850 feet msl). The water table in the well was encountered at 852 feet msl (two feet below the top of bedrock), very close to the base of the bedrock depression. This close correspondence between the well and seismic data, and the relatively high seismic velocity indicates that the seismic refractor corresponds to the top of the Prairie du Chien formation in this area.

Logs of two additional residential wells along La Barge Road indicate the top of bedrock to be substantially deeper than the seismic-calculated bedrock surface elevation. Both of these wells

WAS ENOUGH
INFO COLLECTED
TO CLEARLY STATE
THIS

WHAT ABOUT
923 La Barge

coincide with low refractor-velocity areas. The seismic velocity range of 5,500 to 8,500 fps suggests that bedrock may be extensively weathered in this area, and may have been mistaken by the driller for glacial overburden. Unconsolidated sands, however, would show seismic velocities between 1,200 and 5,500 fps, depending on the degree of saturation.

Line 2

Monitoring well WW-15A, drilled about 30 feet east of Line 2 at station 72, encountered bedrock at an elevation of approximately 860 feet msl, about three feet deeper than the seismic refractor depth. This represents a discrepancy of about 6% of total depth, which is well within normal limits of seismic refraction data.

The residential well at 954 Bakken Road is located about 300 feet west of Line 2 at station 49. This well hit bedrock at about 800 feet msl, considerably deeper than the bedrock surface elevation (862 feet msl) calculated for Line 2. The bedrock velocity at station 49 is relatively high, suggesting a competent bedrock surface. However, the well is approximately 300 feet from the seismic line, and a low-velocity zone is nearby. It is quite possible that such low-velocity, highly-weathered bedrock may have been confused with unconsolidated overburden. A second possibility is that the well encountered a small sinkhole which does not extend as far as the seismic line.

5 CONCLUSIONS

The two seismic refraction profiles acquired near the Junker site show a relatively flat bedrock surface, with no alluvial channels which might significantly alter ground water flow. The only notable structural feature is a small buried depression in the bedrock surface near the south end of Line 1 (La Barge Road). Because no corresponding depression is evident on Line 2 (Bakken Road) there is no indication that this depression represents a continuous channel. Based on the water table depth indicated in a nearby residential water well (923 La Barge Road), the base of this depression would be at approximately the same elevation as the water table. Thus, it appears unlikely that this feature would significantly alter ground water flow.

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