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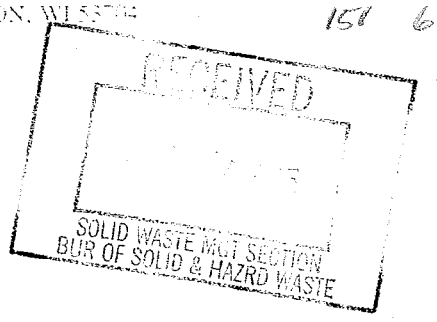


OFFICE COPY

June 13, 1995

Mr. Scott Watson
Environmental Repair Coordinator
Wisconsin Department of Natural Resources
107 Sutliff Avenue, Box 818
Rhinelander, WI 54501

Re: Holtz-Krause Landfill
Construction Documentation Report
D&M # 25823-007-2.2

Dear Mr. Watson:

Please find enclosed two (2) copies of Volumes 1 & 2 for the report entitled:

Construction Documentation Report
Landfill Cap & Gas Extraction System
Holtz and Krause Landfill
Wausau, Wisconsin
June 1995

Thank you for all of our assistance and timely response to resolve various issues during the project construction and the preparation of this document.

Very truly yours,
DAMES & MOORE

David P. Trainor, P.E., C.P.G.
Managing Principal-In-Charge

Gary L. Boley, P.E.
Project Manager

cc: John Robinson, Holtz-Krause Steering Committee (2 Copies)
Bob Grefe, WDNR, Madison (1 Copy)
Connie Nieland, Wausau Insurance, Madison w/o Copy

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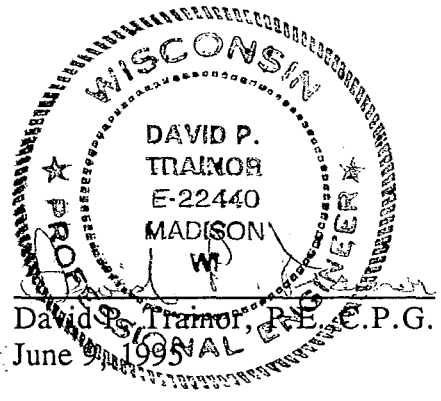
# HOLTZ-KRAUSE LANDFILL
# CONSTRUCTION DOCUMENTATION REPORT

Prepared by
DAMES & MOORE, INC.

The Holtz-Krause Landfill Construction Documentation Report has been prepared by DAMES & MOORE in accordance with the applicable provisions of the Wisconsin Department of Natural Resources NR 516 WAC. It is my opinion, based on testing results and actual inspections, that the landfill final cover and gas extraction system has been constructed in substantial conformance with the approved plans.




David P. Trainor, P.E., C.P.G.
June 9, 1995

# CONSTRUCTION DOCUMENTATION REPORT
# HOLTZ & KRAUSE LANDFILL

June 9, 1995

Dames & Moore Project No. 25823-007

## TABLE OF CONTENTS

# 1.0 INTRODUCTION

The Holtz & Krause Landfill is located in the City of Wausau in Section 6 of T28N, R8E and Section 1 of T28 N, R7E in Marathon County, Wisconsin. The property was originally a sand and gravel quarry, later used as a sanitary landfill for solid waste. The owners of the landfill, Otto Holtz and William Krause, contracted with several municipalities and private industries for solid waste disposal. During the period of 1957 through 1980, the 57 acre site reportedly accepted over 1.4 million cubic yards of municipal, residential and industrial waste. The landfill ceased operation in 1980.

As a result of a 1985 and 1986 USEPA investigation, a Remedial Investigation/Feasibility Study work plan was completed for the property. The Record of Decision specifying the remedial action to be implemented at the site was signed on July 22, 1992, specifying that the site be closed in accordance with WDNR regulations.

The final Scope for the Completion of Remedial Design and Remedial Action (RD/RA) at the Holtz and Krause Landfill Site, Marathon County, WI was approved on September 14, 1993.

This report documents RD/RA construction activities, in accordance with Chapter NR 516 of the Wisconsin Administrative Code and the Scope of Work of the Consent Decree between the Wisconsin Department of Natural Resources (WDNR) and Holtz and Krause Contractors, Inc.

Dames & Moore, Inc., under the direction of David P. Trainor, P.E., C.P.G., provided the on-site construction oversite for the project. Mr. Timothy Stratton served as Project Manager with full-time on-site inspection provided by Mr. Eric Peterson and Mr. Andrew Tease. The on-site team was supported by the River Valley Testing soils testing laboratory of Wausau, WI. WTD Environmental Drilling in Schofield, Wisconsin, performed well abandonment and installation.

Remediation construction was performed by Ryan Incorporated Central of Janesville, WI. Firms which were subcontracted by Ryan include:

- Surveying and Construction as built field verification: Remedial Engineers Incorporated
- Geomembrane Supply and Installation: National Seal Company
- Landfill Gas Combustion System Supply: LandTec/PEI
- Geomembrane Inspection/Certification: Ayres & Associates
- Gas Extraction Well Installation: Terra Engineering & Construction
- Other Major Subcontractors: River View Construction
  Van Ert Electric

Major construction equipment used by Ryan Incorporated Central during the course of this project included:

| Description | No. Required |
|---|---|
| Caterpillar D4C Widetrack Dozer | 1 |
| Caterpillar D6H LGP Dozer | 2 |
| Caterpillar D8N Dozer | 1 |
| Terex TS14 Scraper | 3 |
| Caterpillar 825 Compactor | 2 |
| Komatsu PC400 Hydraulic Excavator | 1 |
| Case 680 Endloader/Backhoe | 1 |
| Case Vibratory Roller | 1 |
| HDPE Welder | 1 |
| Caterpillar 140 Motor Grader | 1 |
| Caterpillar Challenger Tractor | 1 |
| Rome Disc | 1 |
| TS14 Water Tanker | 1 |

Usage of each piece of equipment is logged in the Contractor's Daily Field Reports, included in Appendix K.

Construction was originally scheduled to be completed in two phases. Phase I was scheduled to be completed in 1994 and was to extend from the northern most limit of waste to a keyway at approximately 23+30N. Phase II was scheduled to be completed in 1995 and was to extend

from the keyway of Phase I to the southern most limits of waste. Phase I and Phase II, however, were both undertaken in the 1994 season due to favorable construction progress. All clay hauling and placement, VLDPE membrane installation, rooting zone, topsoil hauling and spreading, and gas extraction system installation was completed between June 13th and December 14th, 1994. Topsoil re-grading, seeding, mulching, repairs on gas extraction well manholes, and follow-up erosion control measures were completed between April 19th and May 30th of 1995.

The grid reference system used during construction was based on the state plane coordinate system truncated as follows:

2,069,000E = 90+00E

402,000N = 20+00N

The Certificate of Substantial Completion for construction of the Holtz & Krause Landfill Final Cover and Gas Extraction System is included in Appendix A. Construction specifications and addenda are included in Appendix B. The contractor's product submittals are included in Appendix D. A chronological photo log of construction progress is included in Appendix E. Plan Sheets 1 through 15, containing as-built cap component elevations and test locations, cap cross-sections, gas extraction system layout and component details, and site plan are provided in Appendix N.

## 2.0 GROUNDWATER MONITORING WELL INSTALLATION AND ABANDONMENT

The remedial construction necessitated the abandonment of various existing groundwater wells. Some were in an area of the landfill that required removal to construct the landfill cap, some no longer were required by the monitoring plans, and others in some way were damaged or impaired since installation. WTD Environmental Drilling abandoned the wells by removing the protective steel casings, recovering the PVC well casings and overdrilling as needed, and backfilling with bentonite chips or slurry. Additional or replacement monitoring wells were also installed by WTD Environmental Drilling. All wells were installed using 2" I.D. Schedule 40 PVC pipe manufactured by Timco, with 0.010 inch slot size factory-cut screens. All wells were fitted with steel ProTops and No. 2 (Key #2121) Master locks.

Well abandonment and installation was performed in accordance with NR 141 and NR 508, WAC. The soil boring logs were recorded on Form 4400-122; well construction was documented on Form 4400-113A; well development was documented on Form 4400-133B; well abandonment information was recorded on Form 3300-5B; and, new Groundwater Monitoring Well Information was completed on Form 4400-89. All applicable forms are included in Appendix L.

Table 2.0 summarizes the pertinent data for each well that was constructed during the remediation project. Table 2.1 summarizes pertinent data for each well that was abandoned.

**Table 2.0**
**Groundwater Monitoring Well Installation**

| Well Name | Date Installed | Depth of Well (From Ground Surface) | Depth of Well (From Top Of Casing) | Length of Screen |
|---|---|---|---|---|
| MW-3R | 5/29/95 | 44.0 ft | 46.5 ft | 10 ft |
| MW-4AR | 7/13/94 | 15.0 ft | 17.8 ft | 10 ft |
| MW-16AR | 7/12/94 | 21.0 ft | 23.5 ft | 10 ft |
| MW-16BR | 7/12/94 | 45.6 ft | 47.8 ft | 5 ft |

# Table 2.1
# Groundwater Monitoring Well Abandonment

| Well Abandonment | | | | |
|---|---|---|---|---|
| Well Name | Date Abandoned | Total Well Depth (From Ground Surface) | Removal Method | Sealing Method |
| MW-3A | 11/4/93 | 47 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 47 ft |
| MW-3B | 11/4/93 | 63.5 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 64 feet |
| Unidentified | 7/13/94 | 20.0 ft | Casing & Screen Pulled, Overdrilled | Bentonite Chips Poured to 20 ft |
| MW-4A | 7/13/94 | 13.0 ft | Casing & Screen Pulled, Overdrilled | Bentonite Chips Poured to 15 ft |
| MW-7 | 5/29/95 | 14.4 ft | Casing & Screen Pulled, Overdrilled | Bentonite Chips Poured to 14.4 ft |
| MW-9 | 11/4/93 | 59.8 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 60 ft |
| MW-13 | 11/4/93 | 41.0 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 41 ft |
| MW-14 | 11/3/93 | 31.0 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 32 ft |
| MW-16A | 10/29/93 | 23.0 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 24 ft |
| MW-16B | 10/29/93 | 47.0 ft | Casing & Screen Pulled | Bentonite Slurry Pumped to 48 ft |
| MW-17A | 10/25/93 | 19.7 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 21 ft |
| MW-17B | 10/28/93 | 48.5 ft | Casing & Screen Pulled | Bentonite Slurry Pumped to 50 ft |
| MW-17C | 10/28/93 | 63.5 ft | Casing & Screen Pulled | Bentonite Slurry Pumped to 65 ft |
| MW-18 | 5/29/95 | 18.0 ft | Casing & Screen Pulled, Overdrilled | Bentonite Chips Poured to 18 ft |
| RW-1 | 11/3/93 | 33.7 ft | Screen Pulled | Bentonite Chips Tremmied to 35 ft |
| RW-2 | 11/3/93 | 27.0 ft | Casing Cut Off Below Surface | Bentonite Chips Tremmied to 35 ft |
| RW-3 | 11/5/93 | 20.0 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 45 ft |
| RW-4 | 11/5/93 | 41.1 ft | Casing Cut Off Below Surface | Bentonite Chips Tremmied to 45 ft |
| RW-5 | 11/2/93 | 25.5 ft | Casing Cut Off Below Surface | Bentonite Chips Tremmied to 45 ft |
| RW-6 | 11/2/93 | 42.0 ft | Casing Cut Off Below Surface | Bentonite Chips Tremmied to 45 ft |

## Table 2.1 - Continued.

| Well Abandonment | | | | |
|---|---|---|---|---|
| Well Name | Date Abandoned | Total Well Depth (From Ground Surface) | Removal Method | Sealing Method |
| RW-7 | 10/25/93 | 24.0 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 25 ft |
| RW-8 | 10/25/93 | 26.8 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 30 ft |
| RW-9 | 11/3/93 | 27.9 ft | Casing Pulled | Bentonite Chips Tremmied to 30 ft |
| RW-10 | 11/2/93 | 21.0 ft | Casing Cut Off Below Surface | Bentonite Chips Tremmied to 25 ft |
| RW-11 | 11/4/93 | 6.0 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 7 ft |
| RW-13 | 11/5/93 | 17.0 ft | Casing Pulled | Bentonite Chips Tremmied to 19 ft |
| RW-14 | 11/3/93 | 6.5 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 7 ft |
| MTW-6 | 11/4/93 | 43.0 ft | Casing Cut Off Below Surface | Bentonite Chips Tremmied to 45 ft |
| MTW-10 | 10/28/93 | 16.0 ft | Casing & Screen Pulled | Bentonite Chips Tremmied to 20 ft |

# 3.0 COMPOSITE COVER CONSTRUCTION

## 3.1 Base Grade Preparation

Clearing and grubbing of the site included the razing of one house in the southwest corner, as well as tree and stump removal across the site. Trees and stumps were buried in a cell in the western slope at 29+00N, 95+50E. Additionally, a stockpile of 273 empty 55 gallon drums found along the south end of the site were also crushed and placed in this waste cell.

The main construction waste cell for Phase I was located in the Northeast end of the site, from approximately 26+00N to 29+00N and 102+00E to 105+00E. Waste placed in this cell included waste excavated from header pipe trenches and debris excavated from around the Chicago & Northwestern Railroad property, including railroad ties. The construction waste cell for Phase II was located in the Southwest corner of the landfill from approximately 17+00N to 18+00N and 109+00E to 113+00E. Waste placed in this cell included waste excavated from header pipe trenches.

The approved design grades are based upon 1991 aerial photography of the site. A survey performed prior to construction in 1994 indicated actual elevations were lower. To account for cut and fill balances, Dames & Moore lowered base grade construction elevations by 0.8 feet as a result of this 1994 survey.

Topsoil was then stripped from the site and stockpiled in a strip along the western edge of the site at approximately 90+00 East extending North and South from approximately 27+00N to 30+00N.

Base grade preparation took place within the limits of waste at the site. Elevations were modified to accomodate higher elevations of waste encountered in the south end of the site. This modification consisted of allowing for a 200 foot strip across the middle of the site at 26+00N

to 28+00N having a 1% slope as opposed to the 2% design slope. The 2% design slope was then resumed at 26+00N and continued to the south.

After cutting and filling of waste and overburden, final base grades were achieved using fill imported from the 3M facility in Wausau, WI. As-built elevations of the base grade are shown in Plan Sheet 2 of 15, "Construction Documentation of Base Grade".

### 3.2 Compacted Clay

Clay was imported from the Hafeman Property at Highway Z and 41st Street, Wausau, WI. Clay placement began on July 29th, 1995, starting on the northwest end of the site. Clay was placed in two 1 foot lifts. Each lift was compacted to a minimum 90% of the modified Proctor maximum density with sheepsfoot and vibratory drum rollers. Compaction and moisture content was tested by Dames & Moore personnel using a Troxler nuclear density gauge. Compaction test locations are shown on Plan Sheets 8 of 15 and 9 of 15. Compaction test results are tabulated in Appendix J, "Field Compaction Testing Results." Desired compaction was not always achieved initially, due to excessive clay moisture. In this situation, the clay was disced, allowed to dry, recompacted, and retested.

Clay laboratory test sample locations for the first lift of clay placed are shown on Plan Sheet 8 of 15. Test sample locations for the second lift of clay placed are shown on Plan Sheet 9 of 15. Results and a summary of clay laboratory analyses are provided in Appendix G.

### 3.3 VLDPE Membrane

Placement of the VLDPE membrane liner began on September 1, 1995, and was completed on November 2, 1994. Installation was performed by a division of National Seal Company from Reno, Nevada. Third-party quality assurance services were provided by Ayres Associates of Eau Claire, WI. All VLDPE membrane installation documentation is included in the Ayres Associates Construction Observation Report, Geomembrane Component of Phase I and II Cap,

Holtz & Krause Landfill, Wausau Wisconsin, dated January 1995. This report was prepared for Ryan Incorporated Central and was submitted to the WDNR in January 1995.

Ryan Incorporated Central placed settlement plates on top of the VLDPE membrane for the purpose of haul quantity verification. Settlement plates consisted of an approximately 1-foot square metal plate placed on an approximately 2-foot square piece of VLDPE membrane, placed directly on the VLDPE membrane cap. A metal rod encased in a capped PVC pipe was extended approximately 2.5 feet above final topsoil grade and surveyed. The stick-up rods on all settlement plates on non-slope areas of the landfill were removed in April of 1995. Settlement plates were left on portions of the western and eastern slope areas of the site for use in determining future settlement of the cap. These settlement plates may be removed in the future.

### 3.4 Rooting Zone

Rooting zone borrow material consisted of sand imported from the 3M facility in Wausau, WI. Hauling of rooting zone borrow material began on September 2, 1994. Rooting zone material was placed in one 34-inch lift and compacted by vehicular traffic on the material during placement.

Topsoil salvaged during initial stripping operations was determined to be unacceptable for reuse as topsoil, and was alternatively placed in the rooting zone layer. Specifically, this material was placed at the south end of the site, and in the toe of slopes along the southwest, south, and southeast ends of the site. On the south end of the site, salvaged topsoil was placed in 6-inch lifts over 18 inches of imported 3M sand and was overlain with Mirafi 104N6 non-woven geotextile fabric to prevent migration of deleterious or oversized matter to the surface. Each 6-inch lift of salvaged topsoil lift was hand picked and mechanically raked to remove oversized and deleterious matter. In the toe of slopes along the southwest, south, and southeast ends of the site, salvaged topsoil was placed to meet rooting zone design grades but was not covered

with geotextile fabric. Areas of salvaged topsoil placement are delineated on Plan Sheet 7 of 15, "Gas Collection/Salvaged Topsoil Locations."

Anchor trenches and subsurface drains at the toe of slopes were constructed as shown on Plan Sheet 12 of 15. Subsurface drains consisted of 4-inch PE corrugated perforated pipe with a nylon sock, covered with a minimum of 6 inches of clean sand. Subsurface drains were not installed along the northeast anchor trench from approximately 93+60E to 102+80E. Subsurface drain outlets along the south end of the site were extended to the south of the Channel 9 access road. Subsurface drain and drain outlet locations are shown on Plan Sheet 6 of 15.

Results and a summary of base grade and rooting zone borrow material laboratory analyses are provided in Appendix H. Sampling locations are provided in the summary of test results in Appendix H.

### 3.5 Topsoil

Topsoil stripped from the site was stockpiled in an area along the western edge of the site. An attempt was made to salvage this topsoil for use on the re-capped site. Placement began along the North end of the site, but the topsoil was found to contain deleterious matter, and placement of the topsoil was suspended. A portion of the stockpiled topsoil was mechanically screened to determine if any portion of the stockpile would be recoverable. Screening, however, proved overly time consuming and expensive. Consequently, imported topsoil was used.

A portion of the salvaged topsoil was spread on the north end of the site, between approximately 31+00N to 36+50N and 94+80E to 101+00E, in one 6-inch lift. This topsoil was hand-picked and screened in place with mechanical rakes to remove deleterious and oversized matter and covered with a 4-inch lift of imported topsoil. The remaining salvaged topsoil was placed along the south end of the site, and in the toe of slopes along the southwest, south, and southeast ends of the site to offset imported rooting zone material quantities.

Topsoil for the non-soccer field areas of the site was imported from the Hafeman clay borrow site, and placed in one six-inch lift. Topsoil for soccer field areas was a mixture of topsoil imported from the Hafeman borrow site, and topsoil imported from the Cedar Creek mall area south of Wausau. This topsoil was placed in three-inch lifts on the soccer field areas, and then tilled to meet specifications.

All topsoil was mechanically raked to remove material exceeding the 3/4-inch size specification for soccer field areas, and exceeding the 2-inch size specification for non-soccer field areas. All topsoil areas were also picked by hand to remove larger rocks.

Results and a summary of topsoil laboratory analyses are provided in Appendix I. Sampling locations are provided in the summary of test results in Appendix I.

### 3.6 Seeding and Mulching

The northwest slope and portions of the east central area of the site were seeded and mulched in December of 1994. Seeding and mulching of the remainder of the site was completed in May of 1995.

Seed was placed with a drop-bucket seeder and pressed into the soil with a roller. Mulch consisted of blown straw.

### 3.7 Handicap Access Path

The handicap access path on the southwest corner of the site was installed in May 1995. The path was constructed of compacted crushed syenite and was lined along the north side with a 4-foot wide swath of excelsior blanket to control erosion. Original specifications called for a 4-foot wide path. However, the path was constructed 5-feet wide, with a maximum slope under 5% to accomodate federal A.D.A. guidelines.

# 4.0 GAS EXTRACTION SYSTEM CONSTRUCTION

## 4.1 Gas Extraction Wells

Gas extraction wells were drilled prior to placement of header piping. Gas extraction wells were installed by Terra Engineering & Construction Corp. of Madison, WI. Boreholes were drilled using a Western bore bucket rig. Screens were placed no less than 4 feet below base grade. Installation of all gas extraction wells was completed on July 28, 1994.

Gas extraction well top of manhole casings were originally specified to be set 6" above final topsoil grade. This height was later modified to 0.1" due to concerns related to possible future public use of the site. Due to the increased (10-inch) topsoil thickness on the north end of the site due to salvaged topsoil placement and imported topsoil covering, gradual drainage swales were constructed around selected manholes to enhance surface water drainage away from the manholes. Swales were constructed around manholes EW-5, EW-6, EW-9, EW-10, HV-3, EW-11, EW-12, EW-13, EW-14, and EW-15, as shown in Plan Sheet 7 of 15, "Gas Collection, Salvaged Topsoil Location."

Several gas extraction well components were damaged during construction and required repair. EW-2 well piping was struck by a dump truck and a crack in the pipe was repaired with a coupling. EW-19 well piping was struck by a grader and required replacement of the riser assembly. EW-21 well piping was struck by a backhoe and required re-compacting around the well piping. EW-22 manhole casing was struck by a dump truck and had to be re-set, although no piping was damaged.

During header pipe trenching, questions arose as to whether the gas extraction well riser assembly would fit into the 36-inch manhole specified. Design modifications were approved to replace ball valves and viton seals with butterfly valves and nitrile seals to fit the assembly in the manhole specified. Riser assembly piping was also modified to accomodate the manhole

size. Modifications to gas extraction well riser assemblies are shown on Plan Sheet 14 of 15, "Details."

Seals in gas extraction well and header pipe manholes on the north end of the site were constructed using a sand/bentonite mix as originally specified (25% sand/75% bentonite). Chip bentonite was mixed with clean sand, poured into each manhole, and hydrated twice. The seal produced from this mix was questionable, and subsequent manhole seals were constructed of straight hydrated chip bentonite. Two 3/4-inch holes were also drilled approximately 3-inches above the VLDPE membrane collar on the south side of each manhole, to enhance drainage. The "weep" holes were covered on the outside with fabric and six inches of clean sand.

The atmosphere and seal in each gas extraction well and header valve manhole was tested in December 1994, prior to start-up of the gas extraction system blower. Results revealed that manhole seals constructed of the sand/bentonite mix were leaking methane from the underlying refuse. These seals were replaced in April and May 1995 with straight hydrated chip bentonite seals. Manholes with replaced seals included EW-2, EW-3, EW-4, EW-5, EW-6, EW-7, EW-8, EW-9, EW-10, EW-11, EW-12, EW-13, EW-14, EW-15, EW-16, EW-17, EW-18, EW-19, EW-20, EW-21, HV-1, and HV-3.

Results of testing in April 1995 showed that the riser assemblies on gas extraction wells EW-7, EW-8, EW-9, EW-16, and EW-22 were leaking air into the header pipe system. The leaks were repaired by tightening the clamps on the flexible hoses and by coating PVC connections with plastic cement.

Due to settlement of the header pipe extensions in gas extraction wells EW-18 and EW-19, the flexible hose connecting the well piping to the butterfly valve on the riser assemblies trapped water and restricted gas flow from the wells. The wells were repaired by redirecting the PVC connections to avoid trapping water, which in turn required replacing the original flexible hose with more flexible neoprene suction hose.

The location of each gas extraction well, as well as the elevation of the north point of each manhole lid, is shown on Plan Sheet 7 of 15, "Gas Collection/Salvaged Topsoil Locations". An as-built drawing of a typical gas extraction well is included in Plan Sheet 14 of 15, "Details".

Data pertaining to construction of the gas extraction wells is included in Table 4.1.

**Table 4.1 Gas Extraction Well As-Built Data**

| Well No. | Planned Final Grade Depth (ft) | As-Built Estimated Final Grade Depth (ft) | Estimated Bottom of Well Elevation (ft m.s.l.) | Screen Length (ft) |
|---|---|---|---|---|
| EW-1 | 31.98 | 33.5 | 1166.2 | 24.5 |
| EW-2 | 33.13 | 39.1 | 1164.5 | 30.1 |
| EW-3 | 41.81 | 36.8 | 1169.2 | 27.8 |
| EW-4 | 23.45 | 35.7 | 1170.0 | 26.7 |
| EW-5 | 36.63 | 38.1 | 1172.0 | 29.1 |
| EW-6 | 32.53 | 45.1 | 1168.0 | 36.1 |
| EW-7 | 29.67 | 43.6 | 1166.0 | 34.6 |
| EW-8 | 32.88 | 44.3 | 1166.0 | 35.3 |
| EW-9 | 36.41 | 46.0 | 1166.0 | 37.0 |
| EW-10 | 27.39 | 43.4 | 1174.0 | 34.4 |
| EW-11 | 20.33 | 18.9 | 1202.0 | 9.9 |
| EW-12 | 17.92 | 41.5 | 1176.0 | 32.5 |
| EW-13 | 16.08 | 23.2 | 1195.0 | 14.2 |
| EW-14 | 17.04 | 31.4 | 1183.0 | 22.4 |
| EW-15 | 21.30 | 37.5 | 1174.0 | 28.5 |
| EW-16 | 33.15 | 41.9 | 1166.0 | 32.9 |
| EW-17 | 30.04 | 27.8 | 1177.0 | 18.8 |
| EW-18 | 31.77 | 33.8 | 1167.4 | 24.8 |
| EW-19 | 32.25 | 24.2 | 1171.1 | 15.2 |
| EW-20 | 32.38 | 36.2 | 1163.8 | 27.2 |
| EW-21 | 33.20 | 29.5 | 1169.7 | 20.5 |

## Table 4.1 - Continued

| Well No. | Planned Final Grade Depth (ft) | As-Built Estimated Final Grade Depth (ft) | Estimated Bottom of Well Elevation (ft m.s.l.) | Screen Length (ft) |
|---|---|---|---|---|
| EW-22 | 27.04 | 29.2 | 1164.3 | 20.2 |
| EW-23 | 23.05 | 26.9 | 1164.6 | 17.9 |
| EW-24 | 17.26 | 21.9 | 1167.3 | 12.9 |
| EW-25 | 21.42 | 18.1 | 1170.7 | 9.1 |
| EW-26 | 20.38 | 16.2 | 1166.6 | 7.2 |
| EW-27 | 24.62 | 25.8 | 1167.6 | 16.8 |
| EW-28 | 15.74 | 14.4 | 1168.8 | 5.4 |
| EW-29 | 24.30 | 18.7 | 1167.2 | 9.7 |
| EW-30 | 23.37 | 22.4 | 1167.8 | 13.4 |
| EW-31 | 22.15 | 23.7 | 1170.3 | 14.7 |
| EW-32 | 19.16 | 22.2 | 1167.0 | 13.2 |
| EW-33 | 20.35 | 20.2 | 1170.6 | 11.2 |
| EW-34 | 17.18 | 22.0 | 1172.2 | 13.0 |
| EW-35 | 12.50 | 18.0 | 1181.1 | 9.0 |

## 4.2 Header Pipe

Trenching for installation of header piping began on July 11, 1994. Header pipe installation began at EW-11 on the north end of the site and continued south and east. The first 480 feet of header piping installed south from EW-11 was Schedule 17 HDPE, whereas specifications called for SDR-11. The WDNR approved placement of the SDR-17 piping, and all remaining piping laid was SDR-11.

All header pipe design elevations were adjusted to accomodate the changes made in base grade design elevations. As-built header pipe elevations for every 50 foot station along the header pipe network, as shown on Plan Sheet 6 of 15, are provided in Appendix F, "Survey Data, Design & As-Built." Each leg of header pipe installed was pressure tested prior to continuing. Upon approval of header pipe elevations and pressure tests by Dames & Moore personnel, header pipe trenches were backfilled with clean sand and tamped.

For ease of installation, the location of several header valves were changed from original design specificaitons. HV-4 was moved north closer to the tee to the header pipe to EW-11. HV-2 was moved from north of EW-1 to south of EW-1, nearer to the header pipe intersection. HV-1 and HV-5 were also moved closer to the header pipe intersection at approximately 93+00N, 24+00E.

## 4.3 Candlestick Flare Station

The candlestick flare station consisted of two skid-mounted blower and flare stack units manufactured by Perrenial Energy Incorporated of West Plains, Missouri, and supplied by Landfill Control Technologies of City of Industry, California. Included with the flare station was a control panel consisting of a low flow fail alarm and blower shut-off, and a timed flare ignition system. Plan Sheet 15 of 15 contains as-built drawings of the blower and flare assemblies, the blower house, and appurtenances.

Blower and flare assembly skids were mounted on 10-inch thick reinforced concrete slabs, as shown in Plan Sheet 15 of 15. Construction of formwork for the concrete slabs began on November 8, 1994. A standard 5-bag mix of concrete was poured into the forms for the blower house, flare, header pipe extension support, and electric transformer. The concrete passed slump and air entrainment tests and 7 and 28-day strength tests conducted by River Valley Testing. The 7-day test revealed a compressive strength of 3500 psi.

Power and telephone cables were laid to the blower house slab via a trench dug south from the blower house slab to a power line connection north of Kent Street, from approximately 23+90N and 95+05E to 16+00N and 95+05E. Power to the blower house was provided by Wisconsin Public Service.

A compacted gravel road to the blower house was installed on April 4, 1995, to provide access for maintenance and monitoring personnel.

### 4.4 Condensate Drainage System

Original plans for the condensate transfer piping called for 6" SDR 11 HDPE pipe inside 8" SDR 11 HDPE pipe. However, 6" HDPE elbows and tees would not fit inside 8" counterparts, and 10" outer piping had to be used. The condensate drainage system was therefore constructed of 6" SDR 11 HDPE pipe inside 10" SDR 11 HDPE pipe.

Anti-seep collars were installed around the header pipe in the trenches leading to Dripleg #1 and Dripleg #2. Anti-seep collars were installed at the limits of waste, and were constructed of VLDPE membrane sealed with chip bentonite and clay. Double wall containment pipe was used beyond the anti-seep collars.

Condensate dripleg #1 was modified by placement of the cleanout pipe and dripleg vent into two separate manholes, as opposed to one. The connection of the 1-inch condensate line from the

demister filter in the blower house to Dripleg #1 was moved to a connection south of the dripleg vent, into the condensate transfer line, due to concerns over recycling of extracted gases.

During excavation of the trench for the condensate transfer line to the manhole on Kent Street, water was encountered in the trench. The design grade of the transfer line was modified from 8.7% to 5% to remain over the water table. The western 45 feet of the transfer line to condensate dripleg #2 was modified from a 2.88% slope to a 0.5% slope to accomodate the change in elevation of the transfer line to Kent Street.

As-built elevations for all components of the condensate drainage system are provided in Appendix F, "Survey Data, Design and As-Built."

## 4.5 Gas Probes

Gas probes were installed by WTD Environmental Drilling on November 3rd and 4th, 1994. WTD Field Boring Logs and Well Construction Reports are provided in Appendix L.

## 5.0 DESIGN MODIFICATIONS

During the course of site construction, there was a total of 34 approved design modifications. Design modifications were recorded on Dames & Moore "Contract Clarification/Interpretation Request" Forms. A copy of each signed modification is included in Appendix C. The following is a listing of design modifications:

| Design Modification No. | Description |
|---|---|
| Design Mod. 1 | Silt Fence Location |
| Design Mod. 2 | Adjustment of Base Grades |
| Design Mod. 3 | Adjust Waste Cell Grades |
| Design Mod. 4 | Revise Extraction Well Elbows |
| Design Mod. 5 | Extraction Well Relocation |
| Design Mod. 6 | Extraction Well Depth Revision |
| Design Mod. 7 | Dripleg Invert Elevation Revision |
| Design Mod. 8 | Revise Extraction Well Valve Seal |
| Design Mod. 9 | Cap Grade Revision |
| Design Mod. 10 | Deletion of Jablonski Site as Clay Source |
| Design Mod. 11 | Add Anti-seep Collar on Header Pipe |
| Design Mod. 12 | Revise Pipe Material Spec for EW-11 |
| Design Mod. 13 | Substitute Soil Using Mining Sand |
| Design Mod. 14 | Revise Manhole Length |
| Design Mod. 15 | Revise 3 Extraction Wells |
| Design Mod. 16 | Correct Damaged Well EW-2 |
| Design Mod. 17 | Allow Excavated Waste as Backfill |
| Design Mod. 18 | Delete Drain Tile Along Anchor Tench |
| Design Mod. 19 | Modify Driplegs 1 and 2 |
| Design Mod. 20 | Settlement Plate Placement |
| Design Mod. 21 | Amend VLDPE Testing |
| Design Mod. 22 | Revise Geomembrane Test Procedure |
| Design Mod. 23 | Adjust Condensate Line Grade |
| Design Mod. 24 | Side Slope Grade Change |
| Design Mod. 25 | Place Imported Topsoil on Side Slopes |
| Design Mod. 26 | Amend Use of Salvaged Topsoil |
| Design Mod. 27 | Remove Debris from Used Salvaged Topsoil |
| Design Mod. 28 | Place Salvaged Topsoil in Toe of Slope |
| Design Mod. 29 | Clarification of Mods. 27 & 28 |
| Design Mod. 30 | Topsoil for Soccer Fields |
| Design Mod. 31 | Amend Seed Specifications |
| Design Mod. 32 | Riprap in Railroad P/L Side slope |
| Design Mod. 33 | Reseal Extraction Well Manholes |

## 6.0 RESTORATION

Several areas outside of the limits of waste were disturbed during construction activities. Areas of concern were the access road to the Channel 9 facilities southeast of the site, the east end of Kent Street, the railroad culvert at the northeast corner of the site, and the leveled areas to the west and southeast of the site.

The access road to the Channel 9 facilities located southeast of the site was maintained by spot-filling eroded areas with compacted crushed syenite, and by continual grading during construction activities. Several utility poles carrying power lines to the Channel 9 facilities were moved south beyond the limits of waste to just north of the access road.

The pavement on the east end of Kent Street was cut during trenching operations to connect the condensate transfer line to the sanitary sewer manhole in the center of Kent Street. Approximately 50 feet of the pavement on the east end of Kent Street was replaced by Ryan Inc. Central subsequent to completion of trenching activities.

A railroad culvert on the northeast corner of the site was abandoned by constructing an earth berm around the outfall of the culvert, followed by filling the berm with concrete. A small portion of the slope around the culvert area was later filled with oversized material picked from the topsoil and shaped to improve the appearance of the area.

Areas on the west end and southeast corner of the site were disturbed during construction activities. Upon initial restoration to grade of the area to the west of the site, a significant pond formed at approximately 28+00N and 92+00E to 27+00N and 93+00E. This ponded area was subsequently regraded to allow drainage to the north. All outlying disturbed areas were seeded and mulched to restore vegetative cover.

## 7.0 DAMES & MOORE OPERATIONS AND MAINTENANCE

Dames & Moore operated and maintained the landfill cap and gas extraction system on site for the first 30 days of operation. During this period, gas extraction wells and manholes were tested for combustible gas leaks in the riser assemblies and manhole seals. Four rounds of gas extraction well, gas probe, and blower house monitoring were completed, and the vacuum at the blower house and at individual gas extraction wells was adjusted to optimize microbial decomposition of refuse while maximizing VOC removal and control of methane migration.

A summary of Dames & Moore operation and maintenance activities and monitoring results is provided in Appendix M.